Vol. 103 No. 2578 THURSDAY OCT 19 1950 9d.

THE MODEL ENGINEER

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD. 23, GREAT QUEEN ST., LONDON, W.C.2

19TH OCTOBER 1950 VOL. 103 NO. 2578

SMOKE RINGS

Our Cover Picture

● WE RECENTLY had the pleasure of attending a preview of three " career " films issued by the Central Office of Information, namely : " Working in a Store," " Working on the Land " and " Making Engines," all three of which are of great interest, and the last-mentioned in particular, from the aspect of our readers. It gives a cross-section of life in a large engineering works, with special emphasis on the training of students and apprentices in all branches of the industry, including the drawing office, pattern shop, foundry, test laboratory, machine shop and assembly shop. The work handled includes the construction of boilers, tanks and heavy equipment, also the manufacture of farm tractors. Apart from the realistic and authentic treatment of the subject, the human interest and friendly spirit among the staff and management should help to dispel the common fallacy that factory work, and engineering in particular, is a sordid and soulless task, or that the employee is a mere cog in a harsh and inexorably-moving wheel. Though the film, in common with the others mentioned, is intended mainly to assist those who are about to select an occupation or career, it will be found extremely interesting to all our readers, especially in respect of the glimpse of leisure activities of employees, which include the construction of model locomotives, aircraft and racing cars. All the films in this series are available to clubs and institutions, either through the services of the C.O.I. Mobile Units, which furnish films, projector and screen, also generator units in cases where electricity supply is not available, or by the loan of 35 mm. and 16 mm. films. A catalogue of films can be obtained for 2s. 6d., together with full particulars of the terms of distribution, from the C.O.I. Central Film Library, 83, Baker Street, London W.1.

An Appeal from Norwich

● IN CONNECTION with its first post-war exhibition, due to open on the 26th of this month, Mr. A. A. Taylor, the hon. secretary, is anxious to get in touch with pre-war exhibitors. All the society's records were destroyed when the premises containing the workshop and library received a direct hit from a bomb in 1942. If this note should catch the eye of any former member who is no longer resident in Norwich, would he please get into touch with Mr. Taylor immediately : the address is 150, Furze Road, Thorpe, Norwich.

A Working Model Water Pick-up

● THERE WAS one feature of Mr. E. Allen's ½-in. scale G.W.R. "Bulldog" type engine at the "M.E." Exhibition that may have escaped the notice of visitors; it is the working model water pick-up with which the tender is equipped. We call it a *working* model because the scoop could be raised or lowered by a proper turn-crank handle at the footplate end of the tender, and all the operative gear was exactly as in the prototype, nicely reduced to scale and with no tendency to clumsiness.

Although this is not the first example of a miniature water-scoop that we have seen, we are tempted to ask if it would be capable of delivering water into the tank if the little engine were to run over a miniature water-trough. This is an interesting question, and we have no actual data to hand with which to answer it. At what speed would the engine have to run in order to lift a column of water some 6 in. in height? We have never seen a miniature water-trough, and we have never had an opportunity to experiment with one; but some reader may have done it, and if so, we would like to hear from him.

An apprentice assembling a tractor. A scene from the Crown Film Unit Production, "Making Engines"

The New S.M.E.E. Headquarters

● THE OPENING of the new premises of the Society of Model and Experimental Engineers, at Wanless Road, London, S.W., has brought to fruition the long-cherished dream of a permanent and adequate headquarters, for which the society has worked vigorously throughout the 52 years of its existence. For many years, the society's workshop and library at Nassau Street, London, W., provided limited facilities in this respect, but the rapidly growing membership of the society, and the more exacting requirements of model activity, not to mention the increasingly important role of the society's affiliation scheme, which now includes over 50 provincial clubs, made it necessary to seek larger and more adequately equipped premises, capable of housing not only a workshop and library, but also a test laboratory and lecture hall. The workshop, which is regarded by most model engineers as the most practical and essential facility of any model society, is now very fully equipped with machine tools of all types, and in sizes capable of dealing with all classes of model work; there is also a separate shop for fitting and light machining, and the test shop contains up-to-date equipment, mostly evolved by the members of the society, for bench testing of locomotives and stationary engines of all types. We trust that the effort of the S.M.E.E. in organising and equipping a truly representative headquarters will reap its due reward in a healthy progress of model engineering attainment and popularity, and an extension of the society's influence in promoting these aims.

The Passing of the "Portable" Engine

by B.C.J.

IN the far off days, some years before the opening of the present century, steam as a driving force was more than holding its own. On the railway, in the factory, on the farm, and indeed anywhere where there was need for power—*steam* supplied that need. A knowledge of the principles of internal combustion was only in the possession of a very few—and those not perhaps manufacturers. And so it came about that when the farmer—of perhaps a hundred years back—was in need of driving force beyond his available *horse* power, he demanded a steam engine, and a *portable* one at that. The manufacturer was not slow to respond to this demand and there have been many makers of portable, and semi-portable engines capable of making, and eager to dispose of these very convenient machines.

But the portable engine is rapidly falling into disuse. It has not, however, entirely deserted the countryside for one of these engines was depicted at work on the cover of THE MODEL ENGINEER of November 28th, 1948, and the writer has himself seen an engine in steam not many years since—but of this experience more will be said on a later page.

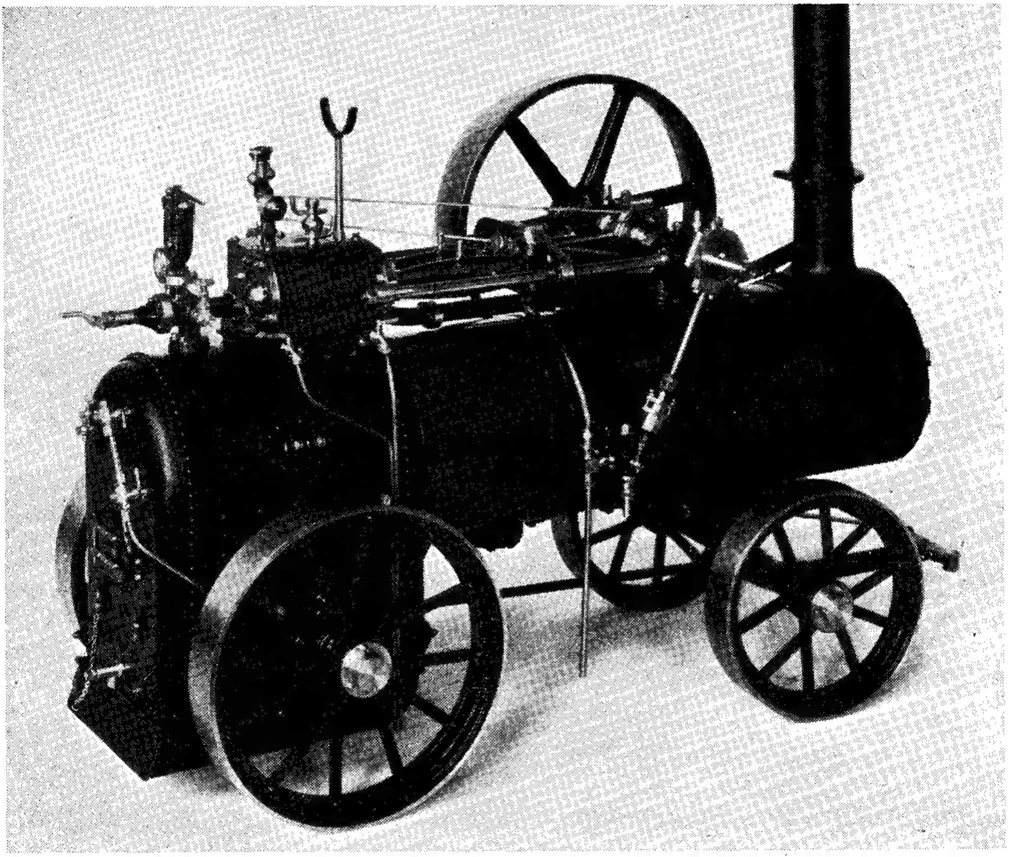


Fig. 1. Model of Robey's portable steam engine (Science Museum)

The Portable Engine as a Model

Now this kind of engine is very well adapted to the skill of the model-maker and he who has the ability to build a small scale locomotive would assuredly find no difficulty in building a small scale portable engine—or semi-portable engine—for I put these two in the same class.

For consider, certain of the most constructively difficult features of the locomotive are entirely

missing in the portable engine, e.g. valve gear, flanged wheels, springs, frame side-members, brakes, bogies, and perhaps others that do not present themselves to my mind at the moment.

On the other hand the outstanding features of the portable engine would appear to be embraced in the following : a locomotive type boiler of simple form, road wheels (if a portable engine) cylinder complete with piston and valve, cross-head, trunk guide, connecting-rod, crankshaft, eccentric and rod, flywheel, boiler feed pump complete, chimney, governor, safety-valve, regulator and finally the usual boiler fittings. A long list perhaps, but comparing favourably in simplicity with the multiplicity of parts essential to the working and well-being of the locomotive.

One feels inclined indeed to offer the suggestion that before any novice sets to work on the building of a locomotive, he should try his luck—if I may so put it—with a semi-portable engine. Is there any other combination of engine and boiler that is constructively more simple ? I doubt it. Admittedly the patterns for the cylinder and the crankshaft bearings, with their arched bases, would need care in the making as would the castings themselves.

That the portable engine has been used as a prototype for a model is obvious, for Fig. 1 is photographed from a model in the Science Museum at South Kensington and represents an engine such as was built by Robey's of Lincoln. This engine is indeed not quite so simple as some of the others illustrated, more particularly as regards the longitudinal stays betwixt cylinder and crankshaft bearings. It would appear that these stays provided rigid connection between these important parts whilst permitting expansion of the boiler barrel due to heat. I cannot see any necessity for such a contrivance in the case of a model having perhaps a short boiler barrel and not by any means a high steam temperature. The engine shown in Fig. 2 would perhaps be a better example to follow.

Just now there seems to be a revival of interest in "old-timers" in locomotives, because such machines really were things of beauty with well-proportioned parts, well blended curves and much else that could be admired ; whilst the portable engine is of much historic interest and, I am sure that a glance at some of the illustrations accompanying this article will convince the average man that the portable and the semi-portable engine were things of beauty too, partly perhaps, because they so well served the purpose for which they were designed and built. So let the model maker see what he can do to produce a model good to look at, and a pleasure to run under steam, and indeed of considerable historic interest.

Fig. 1, already referred to is a Robey engine, whilst Figs. 2, 3 and 4 all depict engines which were originally made by Marshall, Sons &

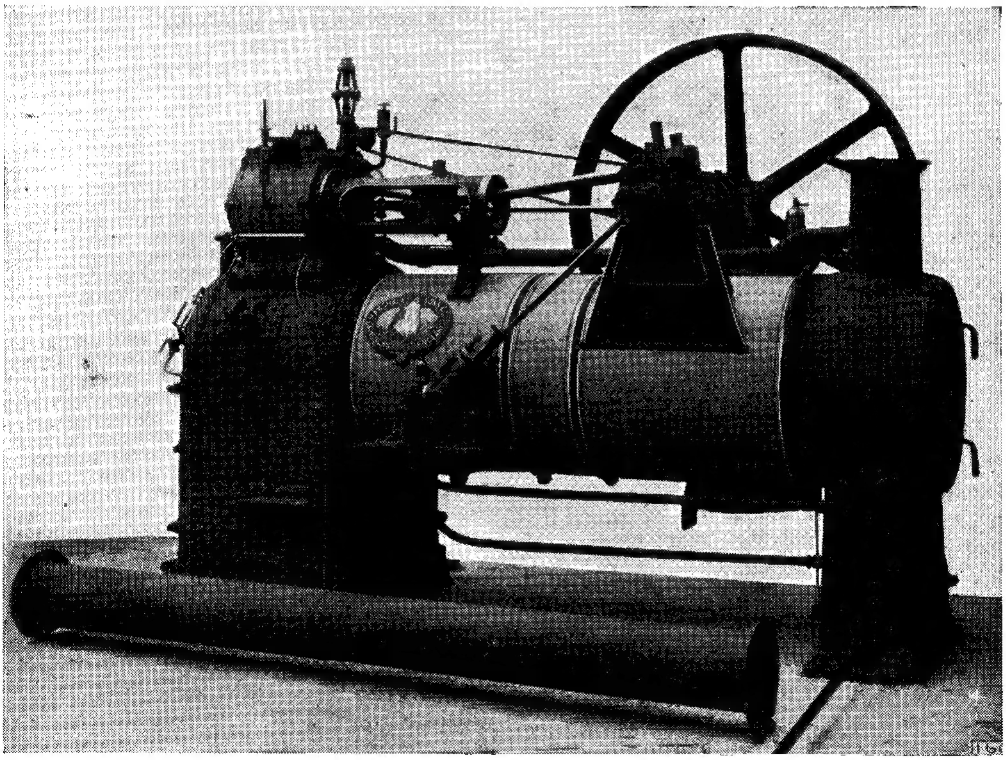


Fig. 2. Marshall's single-cylinder semi-portable engine

Company of Gainsborough, very well known makers of agricultural appliances generally.

Fig. 2 is a semi-portable engine with one cylinder only and of rather simple construction. Conspicuous are a trunk guide, locomotive type big-end to the connecting-rod, bent crank, Pickering governor, a spring-balance safety-valve and a lock-up safety valve.

Fig. 3 is a twin-cylinder semi-portable compound engine. Note the substantial three-bearing casting supporting the crankshaft, marine type con-rod big ends (unusual), twin water gauges, boiler pump and pipe connections and Pickering governor.

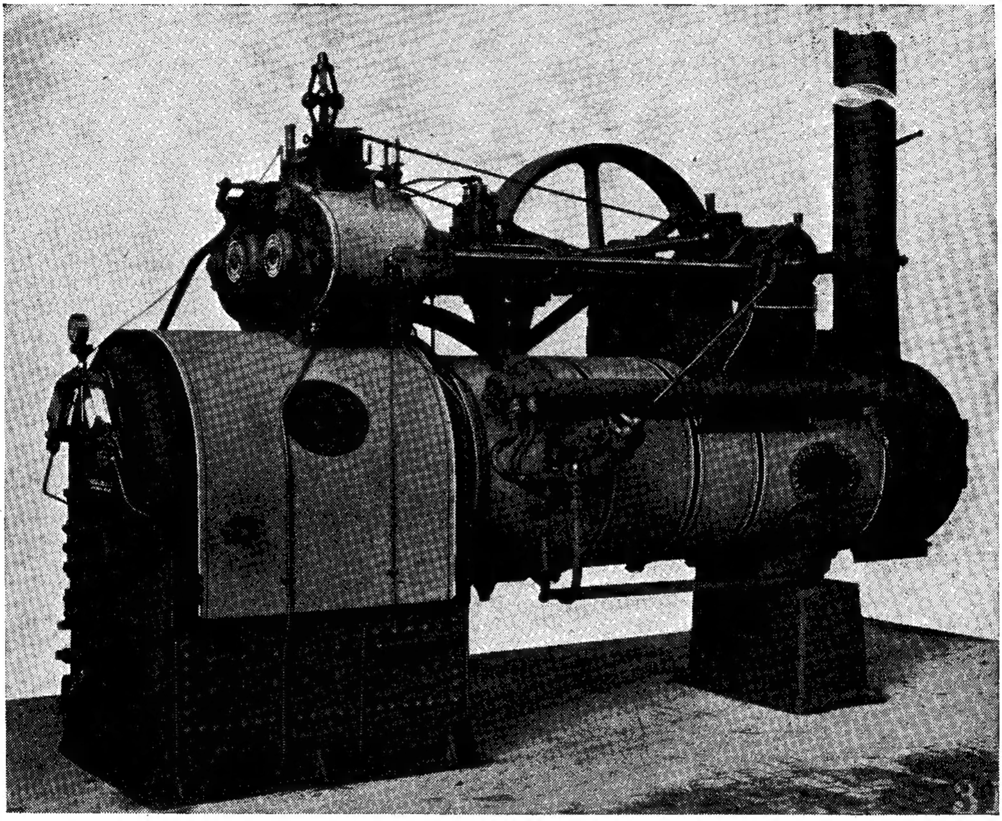


Fig. 3. Marshall's twin-cylinder semi-portable engine

Fig. 4 shows a portable engine with a cylindrical fire-box, evidently intended for burning wood.

Test of a Portable Engine

Not long since, one sultry summer afternoon I was *leanin'* over a gate near a farm when I was disturbed by a rural-looking fellow seeking a passage through the gate. It turned out that he was a farmer, and further, that he was the owner of a portable engine, and still further, that this engine for some unknown reason was very deficient in power. What would be the matter with it—indeed to goodness? (He was a Welshman.) I said I would drop down to his farm and have a look at his engine—which promise I fulfilled in a few days time. When I arrived at the farm, steam was being raised, and I suggested that 25 lb. would probably suffice for my tests—more might have burst the boiler, it didn't look too strong.

Rather naturally my first suspicions rested on the piston and its rings, and the slide valve; stuffing-box leakage would be at once noticed. However, on opening the regulator and the cylinder drain cocks, with the crank placed and fixed at suitable positions there was no evidence of steam finding its way past either piston or valve. Nor did lack of power appear to be due to faulty valve timing. I then made a circular tour round the engine, I should have done this earlier, for I had noticed that the fire was not under the influence of any considerable draught. The reason for the lack of draught became obvious for there was a large jagged hole in the smokebox door into which one might have inserted one's head and the base of the chimney was not in a much better condition. A sheet of stout brown paper held against the damaged door immediately improved matters and the old engine

snorted its approval in the manner of all well-conditioned, and well-looked after steam engines.

My suggestions were: a new smokebox door and a new section of chimney, and this work was efficiently carried out by the local blacksmith, a man bubbling over with efficiency. But sad to relate the owner had in the meantime decided to discard the old steam engine and run a tractor. And thus the poor old portable, with its chimney and most of its brasswork removed, not having been given decent burial in a scrap-yard, lies to this day rusting and rotting out in the open, derelict if ever an engine was! And the end of this story is: that I did *not* ask a fee, and I was *not* offered a cup of tea.

its flapping belt drove a circular saw. You will not find it difficult to imagine I surmise, the combination of noises that assailed one on approaching this iron engine house: the flapping belt, the scream of the revolving saw, the loud chug-chug from the chimney, the regular knock of some ill-adjusted part, and at the luncheon hour, the blast of the whistle!

And as for odours! There were a fine combination, smoke wafted from the chimney, sawdust from sawn wood, hot oil from the working parts, and finally a mixture of hot sea-beach, tar, and seaweed hanging from the piles of a nearby pier. And after all this excitement one might perhaps return to a dinner of steak and onions.

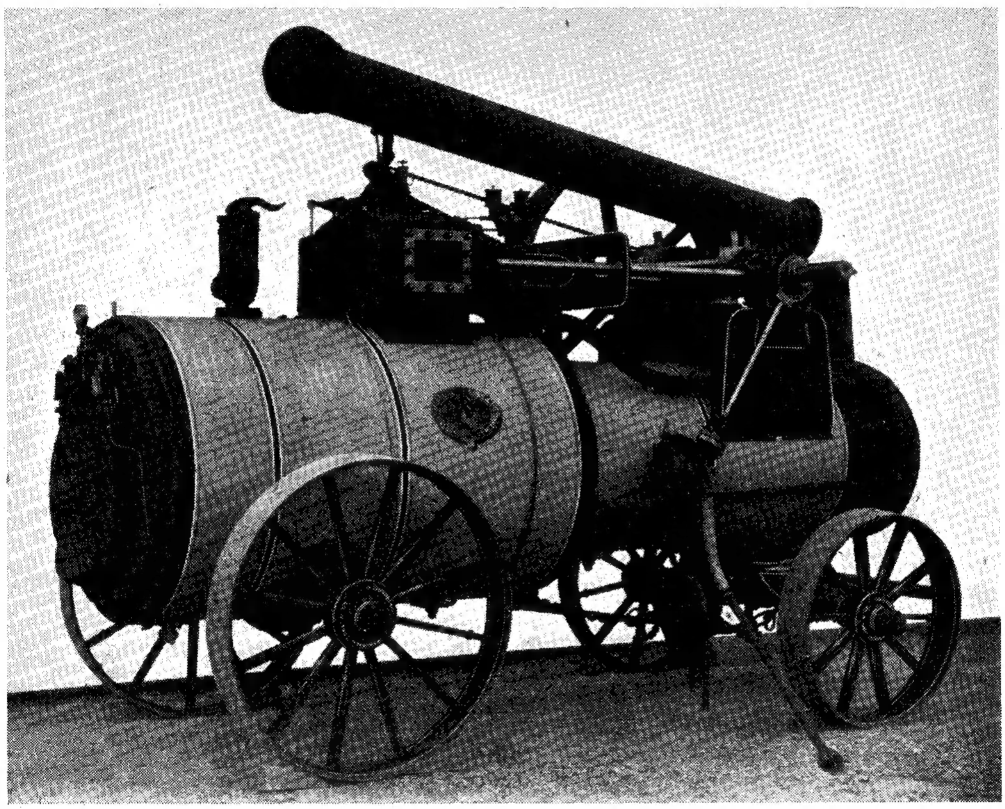


Fig. 4. Marshall's portable engine, with cylindrical firebox

A Semi-portable Engine of Olden Days

There was a time when I used to visit a seaport town on the South Coast, and housed in a galvanised iron shed near the sea was a two-cylinder semi-portable engine of what seemed gigantic proportions. I doubt whether the height from ground level to the top of the firebox could have been much less than 6 ft. The cylinders, of equal size for the engine was a non-compound, would add 18 in. to this height. A fine big engine indeed. There was a heavy flywheel at one end of the crankshaft and a very large belt pulley on the other. This pulley with

Attractions of a Sea-side Town

And now, I cannot resist the temptation to leave the portable engine for a brief space and wander along the quay at Newhaven. For at the close of the last century, there was indeed much of an engineering interest to be digested. Firstly in the L.B. & S.C. Rly. repair shop, there stood a very beautiful vertical steam engine; a single cylinder machine painted in Brighton chrome, and looking very distinguished. A few yards away were engines of the "Gladstone" type standing in the nearby station. One could see

(*Continued on page* 594)

Model Car Supplement

BUILD YOURSELF A BALSA "MERC"

A Cheap and Simply Constructed Scale Model

by C. Posthumus

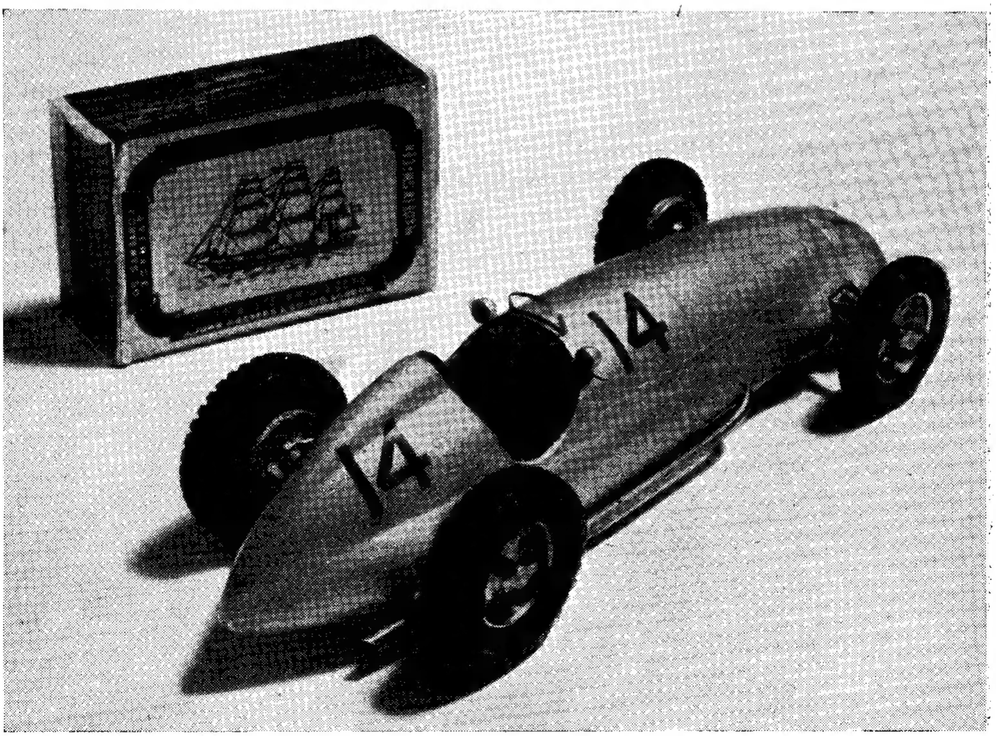
COSTING in all less than 7s. 6d. for materials, the 1/32nd scale model illustrated, of the famous 1939 Grand Prix Mercedes-Benz, forms an interesting subject for the small-scale car modeller, its external simplicity and cleanliness making it an admirable beginner's model. The body is carved from a single piece of balsa wood, while the use of proprietary wheels and tyres circumvents the one great snag in amateur car modelling, the making of wheels without equipment.

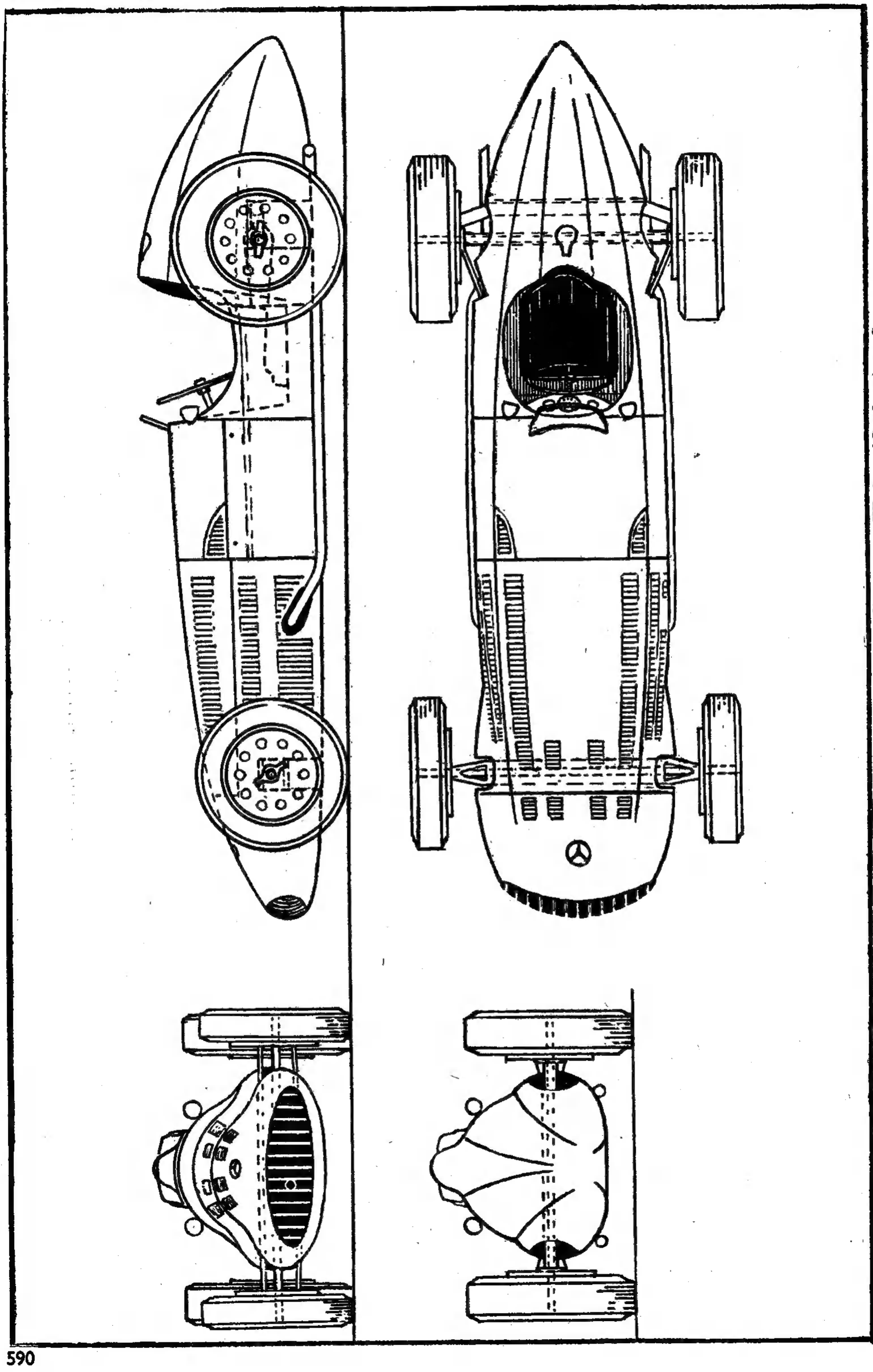
In all, the model consists of: (1) the one-piece body; (2) a front axle with simply devised imitation wishbone suspension; (3) an imitation de Dion-type rear axle with cross tube and radius arms; (4) four brake drums and four wheels; the detail fitments being (5) aero screen; (6) two exhaust pipes; (7) two mirrors; (8) the seat; (9) steering wheel and column, and (10) four hubcaps.

The constructional procedure is as follows:—

The Body

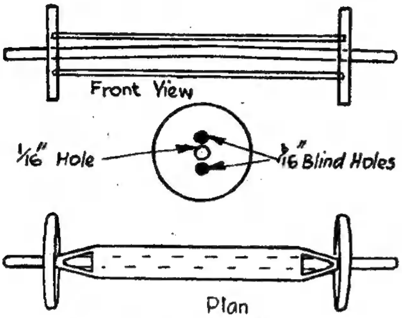
Accompanying drawings show the clean, simple form of the Mercedes body. A piece of approximately $1\frac{1}{2}$ in. sq. balsa, firm—not feathery—and $5\frac{1}{2}$ in. long is required, and can be purchased from any model shop for under 1s. Trace off the side elevation from the drawing, mark out on one side of the balsa block and cut out profile with a small fretsaw, While the body is still square and convenient for holding in the vice, cut out the axle channels as shown, then trace off the top view and mark out approximate line, allowing a fractional increase in length for the drop in nose and tail. Check dimensions by





Four views of the 1939 Mercedes-Benz three-litre, type W163. (Scale 1/32nd)

superimposing on the drawings, then radius the body, using small saw, penknife or coarse files to remove unwanted wood, graduating to fine files and ultimately sandpaper to achieve the finished form. A difficulty in modelling bodies of the Mercedes type lies, not in achieving the right streamline form, but in getting both sides to match, but care and patience can achieve this. Sandpaper, moulded round a pencil or similar rounded object is a useful aid to achieving



Front axle and brake drum

the shapely but tricky curves of the body flanks, while careful work with a small half-round smooth file helps in forming the head faring and tail. When a satisfactory body form is achieved, hollow out the cockpit, using drills, penknife or any other suitable instrument. A broken flat or half-round file, approximately $\frac{1}{4}$ in. wide, ground to chisel shape makes a most useful cutter for such operations.

The Front Axle

In essence, this is a length of $\frac{1}{16}$ in. dia. metal rod-brass, steel, nickel silver or what-have-you, 2 in. in length and slightly bent in the centre to achieve the requisite "toe-in" of the front wheels. Two dummy suspension members, cut out as shown from stiff, thin card (a postcard is as good as anything) are mounted, one above and one below, the axle, their tips engaging with and being cemented into blind holes drilled in the plywood brake drums. These are $\frac{1}{2}$ in. in diameter and $\frac{1}{16}$ in. thick, with a $\frac{1}{16}$ in. hole drilled in the centre to pass over the axle, the whole being cemented in place with Durofix or similar adhesive.

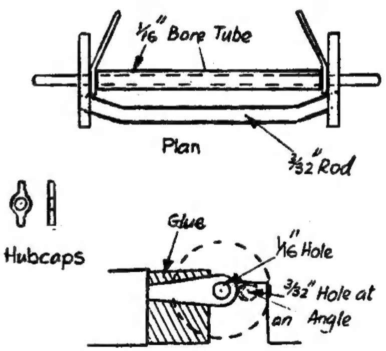
The Rear Axle

The rear track being narrower than the front, the axle, again of $\frac{1}{16}$-in. rod, is only $1\frac{13}{16}$ in. long. Slid over the axle, between the brake drums (similar to those at the front) is a piece of thin brass tubing of approximately $\frac{1}{16}$ in. bore (from your model shop) which serves to thicken the axle in representation of the half shafts, and as a useful distance piece to ensure the correct track. Aft of the hub centre a piece of 3/32 in. brass or nickel-silver rod, cranked at each end as shown, acts as the cross tube of the de Dion-type axle, its ends being accommodated in the brake drums in holes drilled at an angle. The radius arms, cut and pierced in card or thin metal sheet, fit on the axle between the brake drums and the tube distance piece, running forward into recesses cut in the body sides just below and behind the rear cockpit line. Durofix is used for joining the various parts together, and all components made of card are given two or three coats of shellac. This most useful of strengthening mediums is made by dissolving shellac crystals, stocked by your model shop, in methylated spirit.

The Wheels

These are a product of the Scale Model Equipment Co. Ltd., of Steyning, Sussex, and are fitted with realistic treaded Dunlop tyres in rubber. The two sizes available, 23 mm. and 26 mm. dia., are admirably suited for the Mercedes and, incidentally, for many other modern racing car models, such as Auto-Unions, Alfa Romeos, Maseratis, E.R.A.s, etc. Although attractive imitation-spoked wheels are available, those used on the "Merc." are of the cheaper, unspoked variety, sold in cellophane packets of four at 3s. 9d. per set of the larger 26 mm. type—two of which are needed for the rear axle; and at 3s. per set for the 23 mm. size, a pair of these being required for the front. Thus for an expenditure of 6s. 9d. you will have wheels for two models, so that if the Mercedes model turns out successfully (and why shouldn't it ?) a rival three-litre Auto-Union might well be a logical sequence.

As to where to obtain these wheels, various model shops stock them, while the manufacturers can supply readily by post. Those residing in the Thames Valley area may like to know that Messrs. E. Rogers & Sons Ltd., of High Street, Weybridge, Surrey, stock these S.M.E. wheels and other components; and if this smacks of



Rear axle and radius arms

free advertisement I can but reply that the enterprise of the firm in question is deserving of it. They hold a large stock of much-sought modelling materials, and if they haven't a particular item required, will do their utmost to get it. (What's that about "fingers in the pie"? I would stress my interest in this obliging concern is solely that of a customer!) The model being essentially ornamental rather than functional, the wheels do not revolve but are cemented in place to the axles. Before doing this, however, mark out and

drill ten $\frac{1}{16}$-in. holes in the drum portions [redacted] shown, if equipment is available. If not, ten careful dabs of black or grey paint on each wheel with the tip of [redacted] small brush will give [redacted] fair impression of the cooling holes in the actual drums.

The Hub Caps

These are cut to shape, either from stiff card or thin perspex (any colour), [redacted] advantage of the latter material being that it drills and shapes cleanly without fraying. The caps are set in place with Durofix and painted silver.

Aero Screen

This consists of [redacted] small piece of thin clear perspex or celluloid cut and filed to shape. Cut a groove across the scuttle with a Junior-size hacksaw and set the screen in with Durofix, afterwards plugging the groove on each side with plastic wood or filler and cleaning up with file and sandpaper.

Exhaust Pipes

Metal rod of steely hue, $\frac{1}{16}$ in. dia., is required for these—either steel itself or nickel-silver. Brass is less suitable since, for authenticity it would require either plating, which may not be possible, or painting silver, which is less pleasing. Bend the pipes to shape, leaving approximately $\frac{3}{8}$ in.-$\frac{1}{2}$ in. [redacted] shown at the front end, to push into holes drilled in the bonnet sides, and cut the tail end off at the appropriate 45 deg. angle. If using steel rod, polish up with fine emery-cloth, then coat the pipes with clear cellulose, dope or lacquer to prevent rusting.

Mirrors

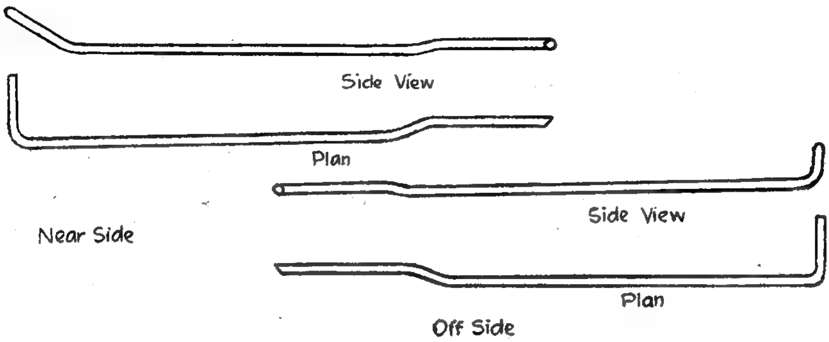
The two mirrors, mounted [redacted] each side of the scuttle, and resembling reversed headlamps, [redacted] tiny shaped pieces of wood attached to headless pins passing into the body. A length of approximately $\frac{1}{8}$ in. dia. round wood—e.g. [redacted] mapping pen handle—is suitable, the tip being rounded off with file and sandpaper by such [redacted] at hand, either power or hand drill, or by hand, then cut off with razor blade or tiny saw, cleaned up and set in place on the pin with adhesive.

Seat

This is modelled from two shaped pieces of 3/32 in. or $\frac{1}{8}$ in. balsa cemented together. The grooving is done with [redacted] knife or file, and the completed seat painted brown and cemented to the back of the cockpit.

Steering Wheel and Column

The steering wheel is cut out in one from [redacted] piece of thin perspex or celluloid, the unwanted segments being drilled and carefully cut away, and the wheel rim and spokes filed true to form.



Exhaust pipes

A large household pin passing into the scuttle acts as [redacted] column, with a tiny nut or collar glued in place close to the wheel hub [redacted] [redacted] boss. The scuttle is bored with a stout needle or thin awl, unavoidably off the correct angle owing to the head faring, the steering column being cranked to offset this. A simpler method of making the wheel is, of course, to find a suitable ring and cement to it [redacted] separate X spoke section fashioned from stiff paper or perspex.

Apart from the screen and the seat, none of the above components should be fitted until the model has been painted.

Finishing

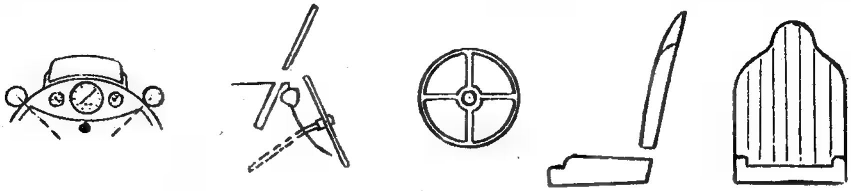
The Mercedes body is coloured silver, with attractively contrasting red numbering. Smooth the balsa body as much as possible with fine sand- (or "flour") paper, then apply a coat of "sanding sealer" (from the model shop) which fills the pores of the wood and provides [redacted] good surface for painting. When dry lightly sandpaper all over again and blow off the whitish dust which forms. If necessary, apply a second coat of sealer and again rub down—with so small and clean-formed [redacted] body this is little trouble and is well worth it. Then, with a transparent celluloid rule and pointed pencil, carefully mark in all body joins, panel divisions, radiator grille surround and the spaces *between* the 13 grille bars (take especial [redacted] with these) the all-too-numerous bonnet louvres and the fuel tank filler flap on the tail faring. Pressed fairly firmly the pencil will form shallow grooves in the balsa, thus when the finishing coat is applied these will remain [redacted] finely defined indentations, easing the task of [redacted]picking[redacted] them out.

Being [redacted] simple and quickly produced model it is desirable to dispense with the complications of undercoating and rubbing down, and providing the surface has been carefully sealed and sanded, two finishing coats of silver dope or cellulose should

be adequate. After applying the first coat (not forgetting to cover the grille area and instrument panel portion inside the cockpit) clean out the body grooving again with [redacted] small edged tool, slightly blunted, such [redacted] screwdriver blade approximately $\frac{1}{8}$ in. wide; rub down any flaws lightly with flour paper, fine emery-cloth or "wet and dry"—whichever is to hand; then apply the final coat and leave the body overnight to harden. While the silver brush is to hand, paint the front and rear axles, steering wheel spokes and column, hub caps and the twin mirrors. Paint the steering wheel rim black or brown, and the cockpit interior with matt black Indian ink, likewise the underside of the body between the two axle channels.

Now comes [redacted] more ticklish job, not to be tackled [redacted] the morning after." With a thin, pointed brush and black cellulose, pick out the spaces between the radiator grille bars. Light pencil lines will help to define their positions, while a useful last resort is [redacted] mapping pen and black Indian ink to "trim" the bars clean. Don't forget the offset starter spindle hole between the fifth and sixth bars, nor the Mercedes three-pointed star badge above the radiator—a circular piece of paper with the star engraved thereon, glued in place and shellaced is quite adequate.

Next, carefully clean out the various lines and joins on the body and the louvres, using the small, slightly blunted tool aforementioned, pressing this gently in so that the finish indents cleanly. Don't overdo the pressure [redacted] the cellulose skin may be pierced. The red number transfers cost 6d. from the model shop for the two sheets of $\frac{3}{8}$ in. numerals required to make up four sets for the "Merc." They are simple to apply but need accurate placing for maximum effect. Any number from [redacted] up to around 36 will suit, omitting the unlucky 13, eschewed by most drivers.



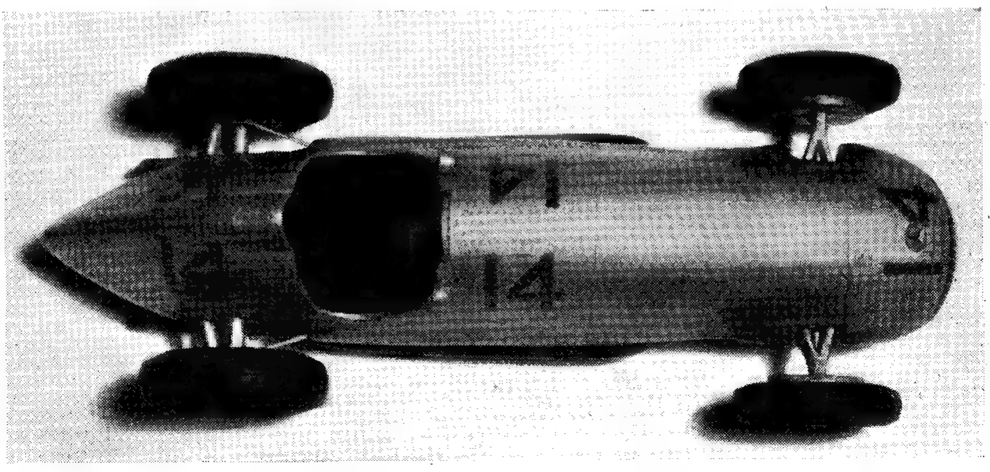
Instrument panel, mirrors and screen; steering wheel and column, and seat

Lastly, the instrument panel: draw in the three dials on the silvered surface—pencilled rings with tiny graduations and needle [redacted] quite effective.

Final Assembly

The means of setting the axles into their respective slots is primitive but thorough, for they are literally buried in a mixture of plastic wood and Durofix, which is brought out flush with, and merged into the underside of the body. Set the axles in this "cement," then, before it hardens completely, set the model on its wheels, place on [redacted] dead flat surface and check that the axle height is correct all round and that all four wheels [redacted] set on a level plane. Then leave to dry overnight.

Next fit the exhaust pipes in place with a cautious blob of glue at the fore end and on the inside of the pipes close to the rear axle. Do not use Durofix or similar synthetic for this, as any excess smeared inadvertently on to the body will attack the finish. Then fit the steering wheel and column, touch in the filled-in axle channels with Indian ink, set in the mirrors, blacken the tips of the exhaust pipes with a spot of paint, and the



View from above, showing the simple outline of the body

task is completed. There is, of course, nothing to prevent the modeller elaborating his 1/32nd scale Mercedes-Benz [redacted] he wishes. Omissions in the [redacted] of simplicity such as steering connections, suspension details, etc., [redacted] all be fabricated without difficulty.

A simple base upon which to mount the Mercedes [redacted] be speedily wrought from [redacted] piece of $\frac{5}{16}$ in. [redacted] $\frac{3}{8}$ in. thick flat ply [redacted] ordinary wood, cut to approximately 6 in. × 3 in. Square up and sand this off smoothly and coat with cellulose, preferably black to contrast well with the silver. The model [redacted] be attached either by four dabs of glue on the tyre bottoms, or by [redacted] of [redacted] single central [redacted] passing through the base into the underside of the body.

"What Did it Do?"

Having completed the model it is well to have "[redacted] tap" [redacted] information on the deeds of the prototype [redacted] help meet the queries of friends and critics. The 1939 W163 Mercedes-Benz racing [redacted] has, in fact, already been described by Denis Jenkinson in *The Model Car News* of April, 1949, before (rather regrettably, I feel) "M.C.N." lost its separate identity and was merged with THE MODEL ENGINEER. Briefly, the cars embodied [redacted] V12, two-stage supercharged twin o.h.c. power unit in [redacted] tubular frame having independent front springing and de Dion-type [redacted] axle. Produced regardless of expense, low, light and leech-like in road holding, possessed of prodigious acceleration, abounding power and [redacted] maximum speed of over 180 m.p.h., the W163, the last of the pre-Hitler [redacted] G.P. "Mercs," achieved [redacted] peak standard in racing design. Its racing record is impressive, to say the least. Running in seven Grand Prix in the abruptly curtailed 1939 season, it won five of them [redacted] the Pau G.P. in France, the Eifelrennen in Germany, the Belgian G.P., the German G.P. and the Swiss G.P. Winning driver in four of these classics [redacted] dynamic Herman Lang, while other team drivers were Caracciola, who took the German G.P., Manfred von Brauchitsch—*pechvogel* or "unlucky bird" of the équipe, who missed many wins by ill fortune, and our own never-to-be-forgotten Dick Seaman, who met a tragic end in [redacted] of these [redacted] at Spa in the Belgian G.P.

Although now ineligible for European G.P. racing under the latest formula, [redacted] of the Mercedes, was purchased in 1947 by American interests and was raced without success two years running at Indianapolis. The intricacies of the power unit, fuel difficulties and lack of data proved insurmountable problems and the car eventually suffered the gross indignity of having its engine replaced by an American six-cylinder design, so tall that the beautiful Mercedes bonnet line has been entirely ruined to accommodate it. The original, however, is surely one of the most beautiful of racing car designs and [redacted] noble subject for a scale model.

The Passing of the "Portable" Engine

(*Continued from page* 588)

many steam cranes with vertical boiler and vertical or diagonal cylinders, and there would be less interesting hydraulic cranes. There would be the cross-channel paddle steamers with their beautiful diagonal engines (one *could* get [redacted] look at the engines); there might be a dredger at work too. And [redacted] the river, in [redacted] soda-water factory, [redacted] well-kept little Crossley gas engine with its obvious hit-and-miss governor. Thus there should have been enough to please the taste of any boy—and [redacted] for myself, I loved the whole lot of them.

More Portables

I [redacted] call to mind a few more portable and semi-portable engines that have come into my vision. On [redacted] farm in sight of the South Downs, [redacted] work threshing, was [redacted] small portable engine of rather ancient vintage I imagine. And [redacted] very dainty little semi-portables were [redacted] one time to be [redacted] steaming away merrily driving roundabouts. I well remember one of these in the grounds of the Crystal Palace; I wonder where this engine is now! A gentleman living near Norwich has in his possession [redacted] small engine which owing to its diminutive size must, I think, be unique (I hope he keeps it under lock and key). One has frequently [redacted] across, in country districts, decaying portable engines with rusting working parts and fireboxes that could [redacted] longer hold water, and chimneys cut short by rust, and wheels hardly in a condition to support the weight of the engine, and indeed no single part is there that might suggest that any such engines could once more perform useful work.

There is [redacted] rather peculiar fact with regard to the manufacture of portable engines which I have [redacted] far omitted to mention. It is this, there appear to have been no makers of portables *west of longitude one*! And this would exclude most of the English counties. It would seem that Suffolk and Essex have been the most prolific in the production of portables. Why?

And to Conclude

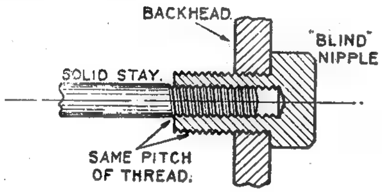
It is indeed [redacted] sad thought, is it not, that while other types of steam engines, of which the locomotive is an outstanding example, will be permitted to perform their allotted tasks maybe for a half-century [redacted] more, the portable engine must now be thought of as a back number. It is probable that [redacted] of these engines still find [redacted] [redacted] in other parts of the world, but the agricultural districts of the British Isles will never again [redacted] them—there will be [redacted] more vapoury clouds of steam and tall puffing chimneys [redacted] the farm.

Let me, in conclusion, express the earnest hope that not only rotting away in the scrap-yard may we find examples of the portable steam engine, but that [redacted] of the best of them may find rest and security in [redacted]

"L.B.S.C.'s" Beginners' Corner

Staying "Tich's" Boiler

BEGINNERS sometimes ask why it is necessary to stay the firebox and end plates of a small locomotive boiler, when they are sometimes thicker than the unstayed barrel; so maybe a few words of explanation may not come amiss. The answer is, staying is necessary because the surfaces are flat. The strongest natural form, is a globe or sphere; the next is a tube. If we could make the boiler in the form of a seamless ball, no stays at all would be needed; and if it were a plain tube, only a hefty stay through the middle, to prevent the ends blowing out, would

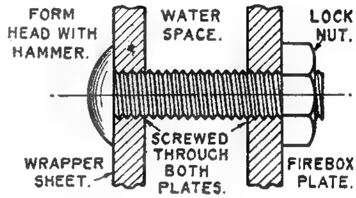


How to fix long solid stays

be all the strengthening required. In the far-off days of childhood, young Curly made a stationary boiler from a discarded cistern float. This was a copper ball, and of very light weight, so that it would float in the tank and operate the water valve; the thickness could not have been more than a few thousandths of an inch. It was made in two halves, each stamped out, and the edge of one half was slightly enlarged so that the other half would fit into it; the joint was soldered. The grey matter under the long golden curls realised that a stay would be needed through the middle, to prevent steam pressure blowing the halves apart at the joint, and one was fitted, made from brass wire, with square nuts laboriously sawn out of a scrap brass clock-plate. Incidentally, that old brass clock frame, given to me by the local watch and clock repairer, provided material for many jobs, including new port plates for the cylinders of my toy *Ajax*. It was about $\frac{1}{8}$ in. thick, and did not have many holes in it. The ball boiler was fitted into the end of a tin can of suitable diameter; holes were cut in the can to ventilate the three-wick lamp, made from a metal-polish tin. The lever safety-valve consisted mostly of the brass part of an old-time "batswing" gas burner. The complete bag of tricks made enough steam to keep a small stationary engine, with an oscillating cylinder made from brass tube, going merrily for an hour or so. I wonder how many present-day kiddies would spend their time rigging up such a contraption!

Longitudinal Stays

Two kinds of stays will be required; long ones to hold the backhead and smokebox tubeplate, and short ones between the inside firebox, and the plates of the boiler shell. One of the long stays is a solid rod; the other is hollow. I used hollow stays in the boilers made in my early days; one of the first had a plug-cock on the backhead for a regulator, and steam went through the hollow stay, which was merely a piece of tube, to the smokebox end, and thence to the cylinders. John "Iron-wire" Alexander used a hollow stay for carrying the regulator rod, on his single-flue type boilers; the regulator was a plug-cock in the smokebox, operated by



How to fix firebox stays

a bit of his beloved iron wire running from the handle on the footplate through the stay, to the handle of the cock. It worked quite satisfactorily. Old Bro. J. A.'s engines were crude and ungainly, but they certainly did the job, and "handsome is as handsome does." He was a pioneer. In the case of *Tich*, we use the hollow stay to carry steam for the blower.

It is essential that stays, both bolts and rods, be screwed into the plates. Again, beginners ask why stays cannot be fitted into plain holes, with the head against the outside plate, and the nut against the firebox plate, the heads being soldered over to prevent leakage. This wouldn't do at all, for the simple reason that the expansion and contraction of the boiler would cause the solder to crack, and the plates, heads, and nuts would begin to part company, letting water leak out. If the stays are screwed through the plates, as in full-size practice, they cannot move in the plates; moreover, if the threads are a tight fit, as they should be, no water should come through, though it is advisable to solder over the heads and nuts, as a kind of "insurance against leakage." Threads in soft copper easily tear, both in screwing and tapping, and it is very unlikely that a beginner will get all his screw threads perfect on his first boiler.

It would not only be inconvenient to screw the whole length of a long stay, between smokebox tubeplate and backhead, but would weaken it; therefore I specify these stays to be fixed by screwed nipples, both "blind"—that is, closed at the head end—and "thoroughfare," or open right through. The rod stay has blind nipples at both ends. The hollow stay carries a thoroughfare nipple at the smokebox end, screwed for a

union connecting it to the bent pipe in the smokebox, which carries the blower jet. At the footplate end, the body of the blower valve acts [redacted] fixing nipple ; this is shown clearly in the detail drawing.

The solid rod stay is [redacted] piece of 5/32-in. copper rod $6\frac{3}{4}$ in. long ; see that both ends [redacted] cut off squarely, then chuck in three-jaw, and put about $\frac{3}{8}$ in. of 5/32 in. × 40 thread on each end, with [redacted] die in the tailstock holder. Wet the die, and the end of the rod, with cutting oil, [redacted] used for turning steel, and pull the lathe belt by hand, working it back and forth, to clear chips from the die. It is the chips getting into the threads in the die, that causes the die to tear the threads on the work. The hollow stay is [redacted] piece of thick-walled 5/32-in. copper tube, not less than 20-gauge, or the threads will weaken it enough to make it useless for staying purposes. I use 18-gauge for similar jobs. Cut to same length, and screw in exactly the [redacted] way, [redacted] the solid stay.

Nipples

To make the blind nipples for the solid stay, chuck [redacted] piece of $\frac{5}{16}$-in. hexagon brass rod in the three-jaw. Face the end, centre, and drill down $\frac{5}{16}$ in. depth with No. 30 drill ; tap 5/32 in. × 40. Turn down $\frac{1}{4}$ in. of the outside, to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. × 40. Part-off at [redacted] full $\frac{1}{8}$ in. from the shoulder ; reverse in chuck and chamfer the corners of the hexagon. To fix the stay in the boiler, screw one end of it into [redacted] of the blind nipples, insert it into the left hand $\frac{1}{4}$-in. × 40 hole in the backhead, and push it through until it shows at the corresponding hole in the smokebox tubeplate. This might appear to be about as thankless [redacted] job [redacted] that of the tramway-car driver whose trolley-pole had [redacted] off the overhead wire in a dense fog on [redacted] pitch-black night ; but whereas the unfortunate motorman has to hold the string of the trolley-pole, and feel for the wire, you can easily guide the stay to the other hole. What I do, is to put a piece of thin tube, longer than the boiler, through both the holes, inserting from the smokebox end ; this is easy enough, [redacted] you can "sight" the tube at the backhead end, and have enough sticking out at the smokebox end, to allow for manoeuvring with your fingers. The end of the stay rod is put in the end of the tube, and pushed right home, the nipple being screwed into the backhead. Now, if you pull the tube out at the smokebox end, you'll find the end of the stay through the hole ; and all you have to do, is to screw the other nipple on it. When the screwed part of the nipple touches the tubeplate, the threads will engage with those in the tapped hole ; and being the same pitch [redacted] the thread on the rod, the nipple can be screwed home tightly, the heads of both nipples seating against the copper plates, whilst the stay rod is held securely between them.

For the thoroughfare nipple, chuck the $\frac{5}{16}$ in. hexagon rod again, and proceed exactly [redacted] described above, for the blind nipples ; but part-off [redacted] $\frac{3}{8}$ in. from the shoulder. Rechuck the other way round, with the screwed part in a tapped bush held in three-jaw ; I have already described how to make tapped bushes. Centre the other end deeply with [redacted] size E centre-drill, and drill through into the tapped hole with No. 40 or 3/32-in. drill. Turn down $\frac{1}{4}$ in. of the outside, to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$-in. × 40. The resulting fitting will look like the adapter I recently described for testing the boiler for pinholes in the brazing, except that one end is countersunk, and the other tapped.

Blower Valve

Chuck the $\frac{5}{16}$-in. rod once more, and proceed yet again [redacted] though you were making [redacted] blind nipple [redacted] described above ; but this time, part off at $\frac{5}{8}$ in. from the shoulder. Reverse, and rechuck in [redacted] tapped bush, same as before [redacted] then turn down $\frac{1}{4}$ in. of the end to $\frac{1}{4}$ in. diameter, and screw $\frac{1}{4}$ in. × 40. Centre the end, and drill right through into the tapped hole in the other end, with No. 48 or 5/64-in. drill. Open out to [redacted] bare $\frac{1}{2}$ in. with No 30 drill, and bottom the hole with [redacted] $\frac{1}{8}$-in. D-bit, [redacted] pump ball seatings. Further open the hole to $\frac{1}{8}$ in. depth, with No. 21 drill ; then tap the rest of the No. 30 section, with 5/32-in. tap. If you have 5/32 in. × 26 or 32, use it, [redacted] the coarser threads give [redacted] quicker action ; if not, then 5/32 in. × 40 will have to do. Be careful not to put the tap in far enough to damage the seating formed by the D-bit.

At $\frac{1}{4}$ in. from the shoulder, [redacted] one of the facets of the hexagon, make [redacted] centre-pop, and drill it 5/32 in. or No. 22, right into the central passageway. A union screw is fitted in this hole ; to make it, chuck a piece of $\frac{1}{4}$-in. round brass rod in three-jaw. Face the end and centre deeply ; drill down about $\frac{3}{8}$ in. depth with No. 40 or 3/32-in. drill. Screw the outside for $\frac{1}{4}$ in. length, with $\frac{1}{4}$-in. × 40 die ; part off at $\frac{5}{16}$ in. from the end, reverse in chuck (you can hold it by the threads, if the chuck is not screwed up tightly enough to damage them) and turn [redacted] $\frac{1}{16}$-in. long "pip" on the end, to a tight squeeze fit in the hole in the side of the valve body. Squeeze it in, and silver-solder it ; after the exercise begin-[redacted] have had in brazing and silver-soldering the boiler, they should know how to do that job without further detail. Quench out in pickle, wash off, clean up, and run the tap in again, to make certain that no burrs are left.

The valve pin is made from [redacted] piece of 5/32-in. round rustless steel, nickel-bronze, or phosphor-bronze ; ordinary brass is too soft, and the valve, if screwed up tightly [redacted] few times, would soon begin to leak, as a groove would be formed around the cone point, by the valve-seating. Chuck the rod in the three-jaw, with about $\frac{3}{8}$ in. projecting ; turn down 5/32 in. length to $\frac{1}{8}$ in. diameter, and form [redacted] cone point on the end. I never bother about turning these points, although, as Inspector Meticulous would tell you, the correct way according to the text-book, is to set over the top slide to [redacted] angle of about 45 deg., and turn the point with [redacted] roundnose tool set at exact centre height. That is, of course, quite O.K., but what your humble servant does, is to take [redacted] smooth file, hold it across the end of the rod at the required angle for the cone, and take about half-a-dozen sweeps across, with the lathe running at high speed. That produces [redacted] perfect cone in two wags of a dog's tail. Pull the rod [redacted] little farther out of the chuck ; [redacted]

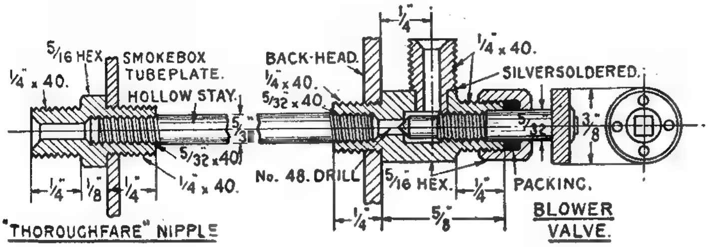
the next $\frac{5}{16}$ in., to match the thread in the valve body, with a die in the tailstock holder. Part off at $\frac{7}{8}$ in. from the point.

The handwheel [redacted] be turned from any material you fancy; brass, bronze, rustless steel, fibre or plastic. Chuck a bit of rod $\frac{3}{8}$ in. diameter; face the end, centre, and drill down about $\frac{3}{16}$ in. depth with No. 42 or 3/32-in. drill. Turn away the front, to leave [redacted] little boss in the middle, and recess it [redacted] little between rim and boss, for the sake of appearance. Set the parting tool to cut off about 3/32 in. behind the face, and feed in

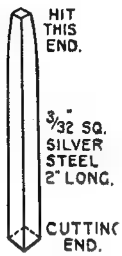
about $\frac{5}{16}$ in. with No. 21 drill, open out to $\frac{3}{16}$ in. depth with 7/32-in. or No. [redacted] drill, and tap $\frac{1}{4}$ in. × 40. Part off [redacted] full $\frac{1}{4}$ in. from the end, reverse in chuck, and chamfer both ends.

How to Fit the Hollow Stay

Screw the body of the blower valve on to the end of the hollow stay, putting [redacted] smear of plumbers' jointing on the threads; be mighty careful not to let any of the jointing material get inside either the valve or the pipe. Now insert the stay in the right-hand hole in the backhead,



The blower assembly



A square hole punch

about $\frac{1}{8}$ in.; then knurl the edge of the wheel. I never use [redacted] knurling wheel, but merely lay [redacted] good sharp second-cut flat file on the rim of the wheel, pull the lathe belt back and forth by hand, and press the file down hard, letting it roll on the wheel. The file teeth cut into the wheel, and the result is [redacted] nobby knurled edge, providing excellent finger-grip without any chance of slipping. Then part the wheel right off, and drill four little holes in the web between rim and boss; about 5/64 in. or No. 48 drill does fine. The hole through the boss is then squared. To do this, file off the end of [redacted] couple of inches of 3/32-in. square silver-steel, so that it is quite flat, and true with the sides. Taper off the other end a little, then harden and temper the squared end, same as I described for D-bits. Lay the wheel on something with [redacted] 5/32-in. hole in it; I keep [redacted] metal disc about $\frac{1}{2}$ in. thick and 2 in. diameter, with [redacted] lot of holes of different sizes drilled through it, especially for jobs like this. Hold the flat end of the punch squarely over the drilled hole in the wheel, and drive it clean through; easy enough if you put the metal block on the vice-jaws, same being partly opened, so that the punch drops between them.

The boss of the wheel will then have a clean-cut square hole in it, and the end of the valve-pin is filed to suit. Put the pin in the three-jaw with $\frac{1}{8}$ in. of the plain end projecting; set No. 1 jaw vertical, and with [redacted] flat file having a "safe" edge—that is, one edge without any teeth cut in it—file [redacted] flat on the end of the pin, keeping the safe edge of the file in contact with the chuck jaw. Repeat operations with the chuck jaw [redacted] the three, six, and nine o'clock positions, and there is your squared end. It should be filed to fit the hole in the wheel tightly; the wheel is then pressed on, and the projecting end of the pin burred over a little to stop it from coming off.

For the gland nut, chuck a bit of $\frac{5}{16}$-in. hexagon brass rod in three-jaw; face, centre, drill down

guiding it to the hole in the smokebox tubeplate, exactly [redacted] described for the solid stay, and screw the valve right home. Put a little more of the jointing paste on the projecting threads of the stay, also on the threads at the tapped end of the thoroughfare nipple; screw the latter [redacted] to the end of the stay until it seats hard against the smokebox tubeplate. Note that when the blower valve is right home, the union screw on it should be standing vertically.

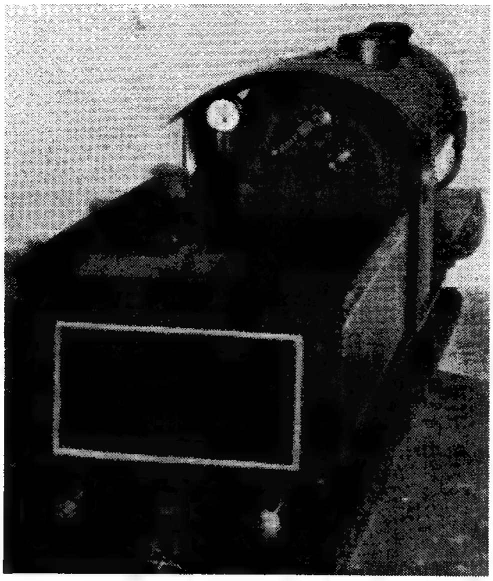
Firebox Stays

The firebox stays are made from $\frac{1}{8}$-in. copper rod, headed over on the outside and nutted on the inside. Mark out all the stayholes, [redacted] given in the longtudinal and cross sections of both larger and smaller boilers, make [redacted] small centre-pop at each point—if you hit too hard, you will distort the thin copper—and drill No. 40 holes clean through both plates, taking care to keep the drill at right-angles to the plate. Tap them all 5-B.A. with one of the special staybolt taps supplied by Reeves or Kennion; these special taps have [redacted] 3/32-in. pilot pin which guides the tap through the holes in both plates, and forms [redacted] thread which will allow the stay itself to fit properly in both plates when screwed right home. A taste of the same cutting oil [redacted] used for turning steel, applied to both drill and tap, will ensure clean threads.

Cut six pieces of $\frac{1}{8}$-in. round soft copper rod about 4 in. long; square off the ends, and screw them 5 B.A., for $\frac{1}{2}$ in. at both ends, holding them in the three-jaw and using [redacted] die in the tailstock holder, with some cutting oil on both die and rod. Clamp [redacted] tap-wrench in the middle, and screw the end of the rod into a stayhole; as it comes through, hold a 5-B.A. brass locknut against it, and let the end of the stay [redacted] into the nut. When the stay is screwed in to the end of the thread, snip it off [redacted] full 3/32 in. from the boiler shell (a pair of top-cutting pliers is the tool for

this job and tighten up the locknut with a small spanner. If any of the stay projects through the locknut, snip that off too. When you have used up all the screwed ends, re-screw them another $\frac{1}{2}$ in., and repeat performance until the lot are in. Note, the threads for the stays in the backhead, must be a little longer, say $\frac{9}{16}$ in.

Put a piece of iron bar in the bench vice, letting it project a little from one side of the jaws. Put the firebox over it, resting one of the stay nuts on it; and using the ball end of the hammer head, rivet over the bit of copper rod projecting from the boiler shell, into a neat rounded head. Take great care to hit the stay and not the boiler. This process will flatten out any stay end which may be sticking out beyond the nut in the firebox. Give all the nuts a final tighten up with a small spanner, but take care not to strip the threads, which is easily done, as the copper staybolts are soft.



A "bridge view"

How to Sweat the Heads and Nuts

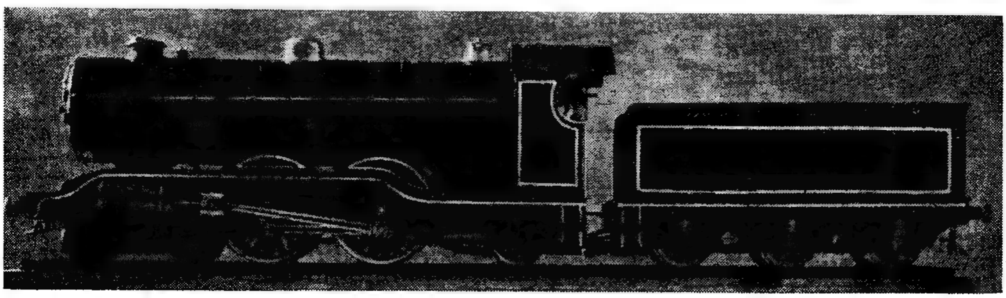
Make a little wire brush by putting a little bundle of thin iron wires into the end of a bit of $\frac{5}{16}$-in. copper tube, and flattening it, so that the wires are tightly held, and fit a wooden handle. Use this to brush some liquid soldering flux all over the stay heads and nuts. Don't use a paste flux for this job, on any account; if any gets inside the boiler, you'll never get it out, and the boiler will be always priming—that is, blowing water from the chimney and safety valves. I use Baker's soldering fluid; but any good preparation of similar kind, or chloride of zinc, or killed "spirits of salts" (muriatic acid with bits of zinc dissolved in it) will do the job.

Heat the boiler, in the brazing-pan, until a stick of solder applied to it, will melt at the end and deposit a blob among the stayheads. Plumber's solder, which has a high melting point, is best; babbit metal, as used for bearings, is also suitable, but ordinary tinman's solder may be used. Keep up the heat, and brush the melted solder all over the stayheads and nuts, until every one is covered. Keep dipping the brush in the flux, add more solder as necessary, and don't get the fumes down your throat. The whole of the inside firebox should be completely tinned over. When all the lot are covered, let the boiler cool off a bit, then well wash it in running water, to remove all traces of flux. We are then ready for the water-pressure test, which will show whether your boilersmithing is good, bad, or indifferent. For this, we shall need the engine's own emergency hand pump; so, all being well, I will next describe how this is made.

"Ayesha's" Maori Sister

Despite the popularity of the more modern locomotive types, the old girls still have their staunch admirers, and copies of my older locomotives are still being built in all parts of the world. The sister to old *Ayesha* illustrated here, was "born and raised," as our cousins over the pond would say, in Christchurch, New Zealand, so she is by way of being a Maori. She is the handiwork of Mr. James Harrison, of the town mentioned, and took all the builder's available spare time for thirteen months; castings, materials, and blueprints being supplied by Mr. L. E. Walcot-Wood. Bro. Jim says she is his first attempt at locomotive-building, and he kept strictly to "words and music," with the

(Continued on next page)



Mr. J. Harrison's version of "Ayesha"

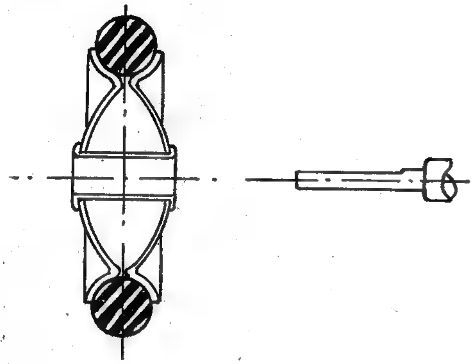
A Tricky Little Job

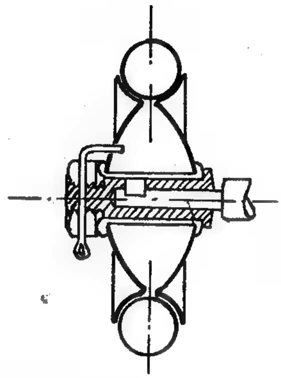
by W. D. Arnot

MOST model engineers meet [redacted] tricky job [redacted] and again and the solution often helps another—at least that is one reason why I read THE MODEL ENGINEER.

The sketches show the solution of one that recently crossed my path. Although " Duplex " drilled in it to leave the hub just clear of the spindle bearing-bush, i.e. [redacted] dead-ended drilling.

How was this hub to be keyed to so slender a shaft which could take [redacted] blow or shock ? There [redacted] shallow flat for [redacted] grub-screw but [redacted] room to fit one.





dealt very completely with the subject of shaft fastenings in the June 1st issue, the collet shown in Fig. 12, which would have been admirable, but for its slenderness, had to be rejected.

A war-surplus synchronous motor, the $\frac{1}{4}$-in. spindle of which ran at 16 r.p.m., just suited a turntable drive, but it had to take [redacted] 2-in. rubber-tyred pressed-steel pulley, the fat boss of which equalled the length of the spindle—and it *had* to be secure endways and against rotational slip.

It was found that the locking cotter of a cycle brake-rod was just [redacted] much larger in diameter than the bore of the pulley ($\frac{1}{4}$ in.) as to give [redacted] shallow flange. One of these was turned down to take the pulley, and the length proved just right to allow the nut on, all but through when the wheel was fitted.

Now the hub was rechucked and a $\frac{1}{8}$-in. hole

A slot was cut across the hub so as to come some way from the end of the spindle. It was intended to carry this slot barely halfway through the spindle, but the spindle was found to be hardened. The flex grinder had to solve that problem. Next, a key was fitted in the slot and finished to conform with the bush.

When the wheel is fitted this key locks the bush in all directions, but it was still possible, should the nut slack off, for the wheel to slip on the bush. After the nut was drawn up, it was cross drilled for [redacted] $\frac{1}{16}$-in. split-pin. The end of this pin was turned over and entered in [redacted] 3/32-in. hole drilled in the wheel face.

There was [redacted] sound job, but it took [redacted] bit of working out and it has been most satisfactory in service, having run for weeks without attention.

" L.B.S.C."

(*Continued from previous page*)

result that the engine is [redacted] great success ; the boiler maintains 90 lb. pressure, and the firebox door has to be kept open a little, to prevent excessive blowing-off. With [redacted] little judicious handling of the regulator, to prevent her " losing her feet " [redacted] she gets away, she [redacted] start [redacted] load of four adult passengers, and [redacted] with them [redacted] bit faster than her owner deems safe ; he has to hold her in ! When the chassis was tested by compressed air, before the boiler was put on, she started [redacted] nine-stone passenger with a pressure of 12 lb. only, [redacted] " distant signal " of things to come.

There is [redacted] need to detail her construction, but it is interesting to note that the cylinders [redacted] 13/16 in. bore, a little bigger than the original, and [redacted] mechanical lubricator was fitted right away whereas my own old girl did not enjoy that little refinement until she went into service on my " nonstop " road. She hasn't [redacted] injector, but [redacted] $\frac{5}{16}$-in. bore eccentric-driven pump, more than supplies the boiler's needs.

At present, our friend is building *Juliet* [redacted] the club engine, with various members assisting with components ; whilst his younger brother is building *Tich*. Here's hoping that they will turn out [redacted] satisfactory [redacted] the subject of the illustrations ; and I'd like to thank friend Jim for his kindly appreciation of these notes.

Multi-Gauge Locomotive Track at Bristol

THE Bristol Society of Model and Experimental Engineers opened negotiations more than four years ago with the Bristol Corporation, for the provision of a locomotive track in one of the public parks. These negotiations were very soon brought to a successful conclusion, but then an unsurmountable obstacle arose, viz., the procuring of the licence necessary at that time to enable new materials to be obtained for such a purpose. The scheme had then to be shelved, but some fifteen months ago the society again approached the appropriate corporation committee, and the subject was re-opened, and with much better luck. The necessary authorities to proceed were soon obtained by the City Engineer's Dept., especially as it was decided to use aluminium alloy rails and so avoid the necessity for a steel permit.

By agreement with, and under licence from the Bristol Corporation Public Works Committee, the Bristol Society of Model and Experimental Engineers undertook to provide locomotives and operate a track to be erected in Carford Park, Westbury-on-Trym, Bristol, for 2½-in. to 3½-in. and 5-in. gauge locomotives.

A suitable design was submitted to the City Engineer's Dept. and that department erected a concrete structure giving a length of 440 ft. in oval form for continuous running, but provided with a gap for a turntable having three "run offs" for locomotive steaming bays.

About eight months ago, actual track laying commenced and to the delight of a large crowd of interested spectators, young and old, the track was officially opened on Saturday May 13th, by Alderman W. H. Hennessy, chairman of the Bristol Corporation Public Works Committee.

All materials for construction were provided by the Bristol Corporation, and the City Engineer's Dept. erected all the concrete work. As soon as the latter was completed in the early part of last winter, the Bristol Society's members took over and got busy producing over 1,600 component parts for the rail assembly. Jigs were produced to speed up repetition work and ensure accuracy of gauges.

The basis of the structure is of concrete uprights, spaced 6 ft. apart. Joining these are straight ferro-concrete beams, set to give straight sides of approximately 70 ft. with 50 ft. radii curves at each end. Cast in the beams are blocks of creosote-impregnated wood, 1 ft. apart, and to these are fixed duralumin "keep plates" with slots milled at correct gauge distances to locate duralumin rails of Vignoles section, the rails being held down by dural. strips and 2-B.A. set-screws into the "keep plates." Dural. fish plates look after the rail joints, all screws and nuts being cadmium plated. For smooth running and additional protection from weather (and to prevent spoiling with oil stains the appearance of the concrete base) roofing felt is fitted between the keep plates.

The turntable, designed by the society, is particularly interesting, [redacted] it rotates on a central pivot with its rails [redacted] little below normal track height. When the section is in position for closing the gap, levers operating [redacted] raise the portion of track [redacted] to concrete abutments in line with the main tracks and this portion is then locked by plungers. This construction ensures rigidity and correct setting of rails for locomotives when travelling through the turntable.

The track has been operated publicly every other Saturday since the opening, and continued to do so until September 30th. The Bristol Society regrets it cannot make an open invitation to members of other clubs to use the track, as this is not permissable under the agreement with the authority, unless such member's locomotives have been "boiler inspected," and passed by [redacted] recognised boiler inspector and insured to the approval of the Bristol Corporation.

The society's licence from the Corporation also provides that any net profit from the carrying of fare-paying passengers shall be divided on a 50 per cent. basis between the Corporation and the society, in addition a nominal rental is paid by the society.

The photographs show views of the track and Mr. Phillips driving his 3½-in. gauge *Princess Royal* with Alderman Hennessy and other passengers at the official opening ceremony.

At the time of sending this report to the press 4,338 passengers have been carried, for which thanks [redacted] due to a noble band of stewards, and locomotive stalwarts: Messrs. Phillips (*Princess Royal*), Hodges (*Juliet*), Penty (*Molly*), Fink (*Hielan' Lassie*) and Hale (*Maisie*). By next [redacted] the society hope to have in operation [redacted] interesting and very unusual 5-in. gauge locomotive (more of this anon, with the Editor's permission).—E. C. H. SMITH.

Novices' Corner

A Feed-Handle for the Drilling Machine

THE spindle feed-gear of small drilling machines is of two main types: in the first, the necessary drilling pressure is obtained by simple leverage, whereas in the other type a rack and pinion gear is employed to afford greater leverage without having to increase the length of the feed lever. If [redacted] drilling machine of the latter type is examined, it will be seen that the spindle is carried in what is termed [redacted] quill, or long bush, that provides the lower bearing for the spindle. The quill does not rotate, but is moved upwards and downwards by the motion of the feed lever and carries the spindle with it. A gear pinion is fitted to the feed shaft, to which the feed lever is in turn attached, and this pinion engages with [redacted] toothed rack cut on the quill; this simple form of gearing then serves to afford the motion for feeding the drill.

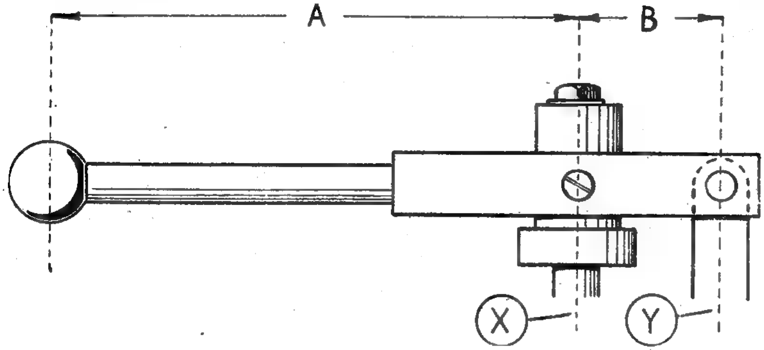


Fig. 1. Showing the leverage obtained by the feed-handle

Mechanical Advantage

The great merit of this system is that, even when a short feed-lever is fitted, the mechanical advantage obtained enables great pressure to be exerted at the drill point but with little hand pressure on the feed-lever. Those who are in the habit of using [redacted] hand drill will know that, when drilling steel, heavy pressure has to be applied to enable even [redacted] $\frac{1}{8}$ in. diameter twist drill to produce continuous, coiled shavings, whereas [redacted] drilling machine normally gives this result. Many years ago, long before electric hand drills came into use, we had to drill some $\frac{3}{8}$ in. dia. holes in the side members of a motor car frame with the aid of only very simple tools. For this purpose, [redacted] carpenter's hand brace [redacted] used, but direct body pressure was found to be quite inadequate to make the drill cut as it should. A baulk of timber, some 6 ft. in length, [redacted] therefore used as a lever to press the brace against the work. While [redacted] of us pressed with his knee against the end of the lever until the brace began to bend, the other turned the brace by hand. This induced the drill to cut good thick shavings and the work was quickly finished.

The rack and pinion mechanism fitted to small drilling machines usually gives [redacted] mechanical advantage of some 10 to 1; that is to say, ignoring frictional losses, a 3 lb. pull on the handle of the feed lever will produce a feed pressure of 30 lb. at the drill point, and this will give satisfactory cutting with drills of medium size. Nevertheless, to gain this advantage, the travel of the feed-lever must be correspondingly increased, and in the example given the feed-lever will have to be moved 1 in. to feed the drill 1/10 in. However, as only a 3 lb. pull is applied to the lever, the feeding of the drill is kept well under control, and there should be but little danger of the drill point becoming jammed in the work as it breaks through.

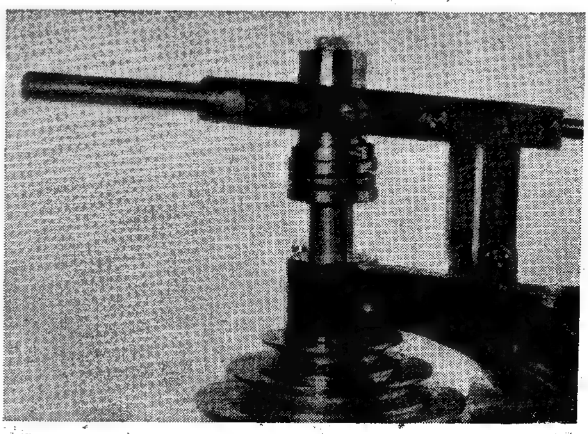


Fig. 2. Showing the lever mounting attached to the machine

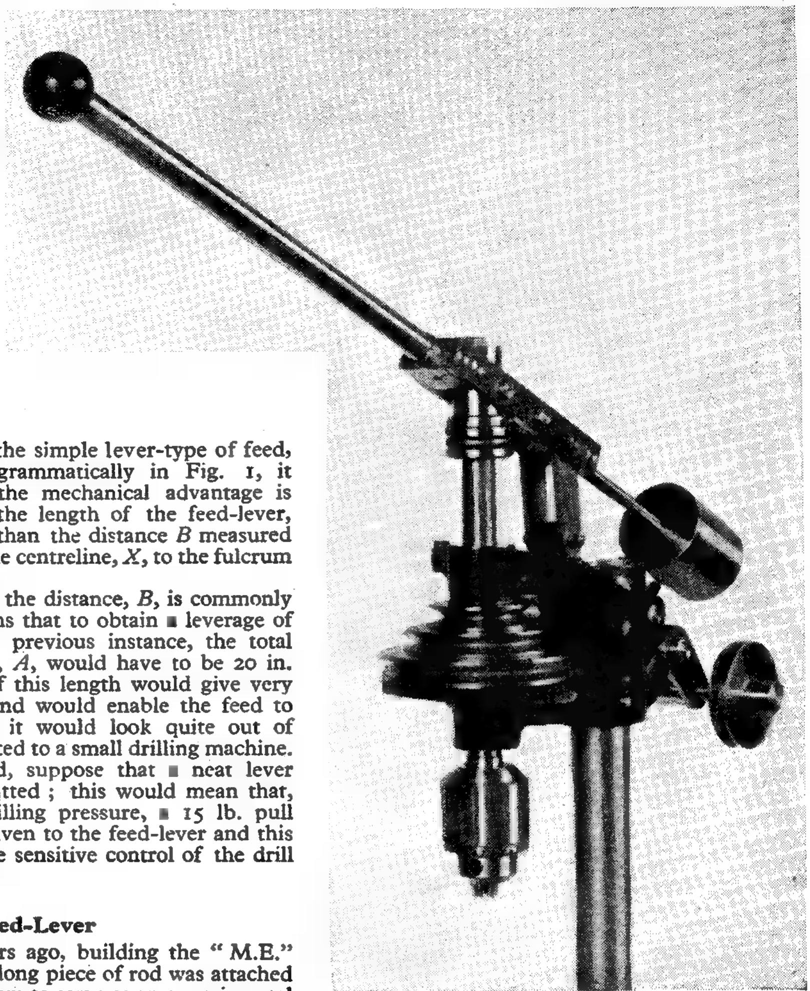


Fig. 3. The drilling machine with the feed-lever in place

The Lever-Type

Turning now to the simple lever-type of feed, as represented diagrammatically in Fig. 1, it will be seen that the mechanical advantage is gained by making the length of the feed-lever, distance *A*, greater than the distance *B* measured from the drill spindle centreline, *X*, to the fulcrum centreline, *Y*.

As in small drills the distance, *B*, is commonly about 2 in., it means that to obtain a leverage of 10 to 1, as in the previous instance, the total length of the lever, *A*, would have to be 20 in. Although a lever of this length would give very sensitive feeding, and would enable the feed to be well-controlled, it would look quite out of proportion when fitted to a small drilling machine. On the other hand, suppose that a neat lever 4 in. in length is fitted; this would mean that, to exert 30 lb. drilling pressure, a 15 lb. pull would have to be given to the feed-lever and this would in turn make sensitive control of the drill extremely difficult.

Experimental Feed-Lever

When, some years ago, building the "M.E." drilling machine, a long piece of rod was attached to the feed mechanism to serve as an experimental feed-lever; drilling tests were then carried out with the feed pressure applied at various points along the lever. In the end, it was decided to make the lever of a total length of 9 in. as represented by the distance *A* in Fig. 1. This gave a mechanical advantage of 4½ to 1 and the appearance was not unsightly.

Tests

Some tests carried out at the time gave the following results and may be of interest. A new ⅛ in. diameter carbon-steel twist drill of best make was gripped in the chuck of a ⅜ in. capacity drilling machine, and the machine was set to run at 1,100 r.p.m. for drilling a piece of mild-steel. A spring balance was then attached to the end of the feed lever, which with its rack and pinion feed mechanism had a mechanical advantage of 8 to 1. It was found that a pull of 5 lb., representing a drilling pressure of 40 lb., was required to obtain fast cutting accompanied by the formation of two continuous drill shavings. When this test was repeated in the "M.E." machine, using the same drill, material, and drilling speed, a pull of 8 lb. at a distance of 9 in. corresponding to *A*, Fig. 1, was found to be necessary to give approximately similar results. However, as reasonably fast drilling for this small machine and a fairly sensitive feed could be obtained by using a 6-lb. pull, the 9 in. feed lever was adopted.

Saving Space

For the sake of convenience in working and to save space, the small drilling machine was mounted towards the front of the bench, but this meant that the long feed lever, by projecting beyond the bench, was liable to be damaged by being knocked against whilst one was moving about in the workshop.

To remedy this, it was though best to make the lever so that it could easily be detached when not

in use. For this purpose, as illustrated in Fig. 2, a stub mounting was screwed into the feed lever bracket, and the tubular hand-lever was then made a sliding fit on the projecting end. The appearance of the detachable feed-lever when mounted in place is shown in Fig. 3.

Making the Feed-Lever

The stub mounting, illustrated in Fig. 4, is machined from a length of $\frac{7}{16}$ in. or $\frac{1}{2}$ in. diameter round steel rod. The rod is gripped in the self-centring chuck and a length of some 2 in. is turned down to form a sliding fit in the piece of thick-walled steel tubing chosen to form the lever. If no suitable tubing is available, a length of rod can be used when drilled axially for the required distance and having its other end machined for mounting the ball handle. It is, however, advisable to make the feed-lever, as a whole, as light as possible consistent with adequate strength.

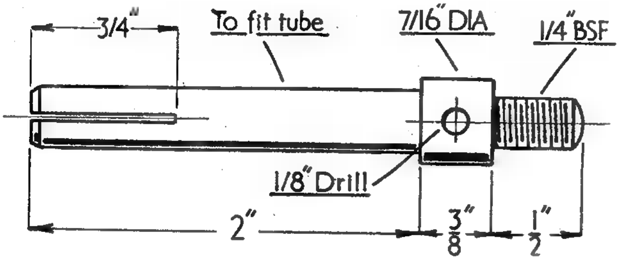


Fig. 4. The stub mounting for the tubular feed-lever

The stub mounting is next gripped in the lathe toolpost and a narrow circular slitting saw is used to slit the part for a distance of $\frac{3}{4}$ in. or a little more. Following this, an $\frac{1}{8}$ in. diameter hole to receive a tommy bar is drilled, in line with the slit, in the shouldered portion of the work.

The Threaded Nose

To form the threaded nose, the stub is again gripped in the chuck for turning to size and threading with the aid of the tailstock die-holder. The stub, when screwed in place in the feed-lever bracket, should lie with the slit vertical and, for the sake of appearance, with the tommy-hole on the under side.

The slit is located vertically so that pressure applied to the feed-lever will not tend to close the slit and so loosen the fit of the lever on its mounting. If the part does not line up correctly, it should be re-chucked and a facing cut of appropriate depth taken over the abutment face of the shoulder. As to give the part a full turn would require the removal of nearly 38-thousandths of an inch from the face, the amount needed to be turned off for any fraction of a full turn can readily be calculated.

The steel tube forming the lever is next cut to length, and a spigot of the form shown in Fig. 5 is made to fit the bore firmly. It will be seen that the threaded end of the spigot, on which the ball handle screws, is fitted to lie at a short distance within the tube; this is to allow the spherical surface of the ball to seat evenly against the lip of the tube. When the correct position has been determined, the spigot is finally fixed

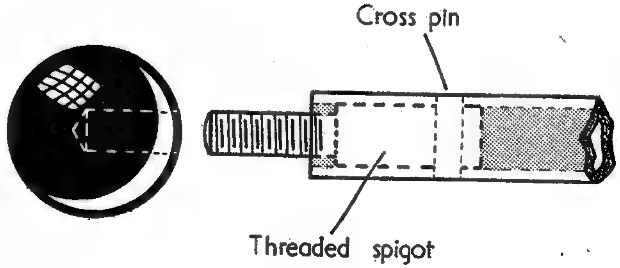


Fig. 5. Method of attaching the ball handle to the feed-lever

in place by means of a cross pin located near the inner end. The surface of the tubular lever can then be given a good finish by polishing it with a strip of worn emery cloth well-supplied with thin oil.

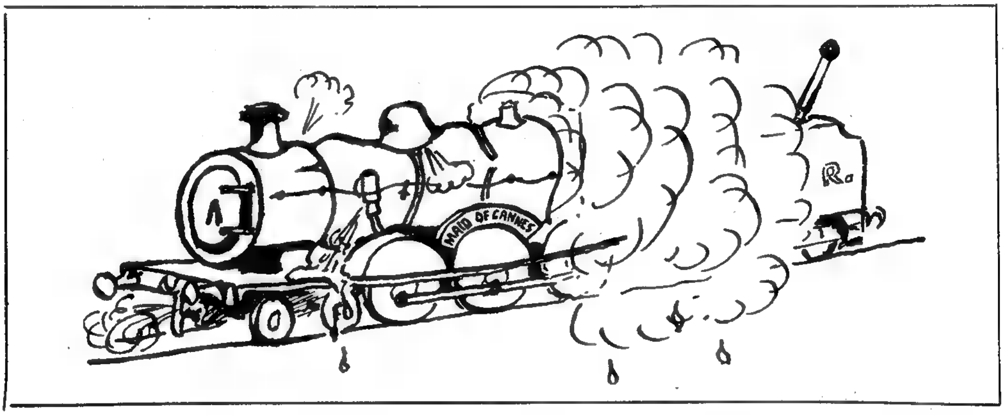
It will probably be found that the slitting operation has caused the end of the stub mounting to open slightly and thus afford the lever a light frictional grip. In any case, the lever should slide on to its mounting quite smoothly and without shake, but should wear develop in the course of time, the fit can be easily corrected by slightly expanding the slit end of the stub mounting.

Improvements and Innovations

No. 11—Dangerous Engines

by "1121"

IN connection with the S.M.E.E. Affiliation's scheme for the certificating of passenger-hauling locomotive drivers, we have said [redacted] considerable amount about these drivers, and the undesirable habits of which they are frequently guilty. Having [redacted] last got the scheme launched, we think it opportune now to switch our attention to [redacted] closely-allied subject—that of engines whose design, construction, or state of repair renders them liable to unfavourable comment from any person who is expected to bear responsibility for their behaviour. It must be realised that should any engine be the cause of injury to [redacted] bystander, through some fault in the engine itself, the blame, in the event of an official inquiry, would be settled not [redacted] its owner, but on the track superintendent who had allowed such [redacted] engine to run. We know some people who are adept at offering to assume responsibility [redacted] means of by-passing regulations, but they fail to appreciate that they [redacted] just not in [redacted] position to "assume" responsibility so easily, and neither is the person in authority at liberty to grant it. One cannot have responsibility dodging about from shoulder to shoulder like this, or it just ceases to exist at all, and you might [redacted] well proceed without the appointment of any one official superintendent. If there is such a superintendent, he and he only will have to answer to any charges, and the type of folk we have mentioned would do well to remember that any of this unofficial assumption of responsibility [redacted] be of [redacted] effect whatever, except for letting the superintendent well and truly in the cart should any accident occur.



It goes without saying that by far the most likely part of an engine to cause trouble in this way, is its boiler, and we have on occasions been surprised, to put it very mildly indeed, [redacted] the nonchalant attitude of some people to [redacted] boiler they have built [redacted] acquired second-hand, with not a thought for the possibility of its being unsafe to carry steam-pressure. We understand that the approved method of finding out whether [redacted] pearl is genuine or not is simply to run [redacted] steam-roller over it. If it really *is* worth [redacted] fabulous fortune it will come out all right. If it doesn't—well, it wasn't. We submit that such [redacted] process calls for [redacted] certain degree of confidence, not to say courage, but it is our opinion that [redacted] number of model locomotive owners tend somewhat towards such methods on the occasions when they *do* give a thought to the question of whether their boilers are sound or otherwise. Let's stoke it up well, is their attitude, shut everything off except the blower, and sit on the safety-valve. If nothing untoward happens, then the boiler is O.K. If it busts and blows everybody to smithereens—well, there must have been something wrong with it. We suggest that such methods of judging the safety of [redacted] boiler involve not so much confidence [redacted] even courage, [redacted] highly-developed degree of ignorance and capacity for foolhardiness, attributes similar to those required for the well-known process of looking for a gas-leak with a candle.

Now, the S.M.E.E. Affiliation sets out to supply many facilities for the convenience of its associated clubs and their members. One of the facilities, the underwriting of the competence of drivers to perform under arduous working conditions, has been receiving [redacted] good deal of publicity, but there [redacted] others which [redacted] not [redacted] well known, such as availability of drawings, photographs, books, etc., of interest to model engineers, and, under certain circumstances, workshop facilities and convenience for meetings. The difficulty against the inauguration of [redacted] interchange system of this nature has always been found to arise from the unwillingness, apparently inherent in club secretaries, to reply to communications from headquarters, and while

every [redacted] of the 50 odd clubs in the Affiliation is circulated with full particulars of all the facilities that the affiliation has to offer, requests for suggestions for other facilities, and appeals for material for the common pool to increase the scope and effectiveness of these facilities, only about half-a-dozen or [redacted] of this number take the trouble to reply, let alone contribute [redacted] much [redacted] suggestions for improvement. The others only open their mouths, when the spirit moves them, to demand to know what they are getting out of belonging to the Affiliation!

This, however, is a digression—we were about to say that among the Affiliation's lesser-known services [redacted] several sets of apparatus, located in various clubs, for the accurate testing of boilers under hydraulic pressure, and the checking of pressure-gauges, and setting of safety-valves. We venture to predict that if any locomotive owner cares to remove a pressure-gauge that has been in service for a number of years, and check it [redacted] have it checked against [redacted] master-gauge, he may get [redacted] shock! We have known of *brand-new* pressure-gauges which, on checking, have been found to be inaccurate by [redacted] much [redacted] 25 lbs., and when this fact has been pointed out to the suppliers they have obligingly changed the gauge for another which has proved to be just [redacted] bad. We would go [redacted] far, in fact, as to assert that in our experience there [redacted] very, very few commercial pressure-gauges, of the type supplied for model boilers, which even approach the degree of reliability which should be an automatic guarantee for such a vital piece of equipment. Furthermore, when they have been in use for [redacted] time, one can add to their initial inaccuracies the fact that their moving parts become so badly worn that [redacted] flip of the finger will send them 20 lb. either way with no alteration of the pressure to which they are being subjected! We consider that this state of affairs, in view of the serious issues involved, borders on something like criminal negligence, and we suggest that if [redacted] independent body such [redacted] the Affiliation were to be called upon to check these gauges, either in bulk before sale or privately after purchase, with publication of full and genuine results, the information thus obtained would be of real value.

We have mentioned safety-valves, and would now enlarge on this by observing that people frequently fail to realise that a safety-valve which performs its allotted function [redacted] [redacted] boiler may be totally inadequate for the requirements of another. To do its job properly, it is not sufficient that the valve should merely lift at a predetermined pressure. To be a complete safeguard, which is, after all, its sole reason for existence, it must *prevent [redacted] further rise in pressure* under any circumstances. Thus in the event of [redacted] engine being inadvertently left with the blower turned on, the safety-valve must be *big* enough, or there must be enough safety-valves, to pass all the steam that the boiler [redacted] produce if left to its own devices, and without the human element to pounce upon the engine and turn off the blower.

Closely allied to this business of the safety of the boiler is the matter of feeding it with water [redacted] and when required, and [redacted] have [redacted] rule on the S.M.E.E. track which [redacted] that [redacted] engine must be allowed to [redacted] which has less than *two independent* methods of getting water into the boiler. What these methods [redacted] [redacted] don't mind—they may be [redacted] axle-driven pump and an injector, [redacted] two injectors, or [redacted] steam donkey-pump and [redacted] hand-pump (ugh!). On occasions [redacted] may be presented with [redacted] very nice engine, which [redacted] unfortunately cannot allow to run simply because it has [redacted] alternative [redacted] of feeding the boiler, nor even [redacted] screwed connection anywhere, where [redacted] could attach our beer-pump. (see "Pumps and Things"). We assure any owners who may in the past have gone to considerable trouble to bring [redacted] otherwise perfect engine to [redacted] exhibition, that their disappointment is no greater than our [redacted] when we find it cannot run.

We once [redacted] [redacted] engine which had been cracked up to be [redacted] wonderful that we came to consider ourselves as very highly priviledged even to have it on our track, let alone put our own people on to drive it. It literally bristled with pumps and injectors of every description, and we therefore considered it fulfilled all the necessary conditions—until [redacted] wanted to get some water into the boiler in a hurry, and then we found that not [redacted] of its many methods of feeding water would do that. As it turned out, the driver *hadn't* let the water down suddenly after all, but [redacted] play safe—the vanishing trick performed by the water [redacted] due to nothing more than [redacted] bunged-up water-gauge fitting, but it just shows you can't be too careful.

This brings us to another point—the danger of false-reading water-gauges. In many fittings the passage-ways are ridiculously small compared with the size of the glass itself, and the water plays such peculiar antics in the column that it is almost impossible to tell whether it is really there or not. We implore all drivers, should they have the slightest suspicion that a water-gauge may not be showing the true level, to stop and make sure, either by the routine of clearing both fittings alternately by shutting off the other one and opening the blow-down, or, if the gauge has [redacted] cocks, by lifting the front end of the engine slightly and observing whether the water rises in the glass. A sluggish water-level, which does not seem to bob up and down with the movements of the engine [redacted] it might be expected to, almost certainly indicates that one of the fittings is stopped up, and the apparent level [redacted] seen in the glass may not bear any relationship to the actual state of affairs inside the boiler. If this is the case, brother, beware! Many drivers make [redacted] habit of clearing both fittings through the blow-down when taking over an engine, and this practice, apart from satisfying the [redacted] concerned that all is well with the gauge, also serves to keep the cocks in [redacted] movable condition, and not seized up solid [redacted] that they could not be shut off in the emergency of the glass breaking. While [redacted] this point, if one of the nuts on the glass column should start [redacted] weep while the engine is in steam, resist the temptation to tighten it up until the engine is out of service and the pressure gone. You *may* cure the trouble, or you *may* split the glass from end to end. One engine [redacted] know regularly breaks bits off the bottom end of its gauge-glass almost every time steam is raised in it, due, [redacted] think, to misalignment of the fittings.

*A Double-Acting Twin-Cylinder Feed-Water Pump

by J. I. Austen-Walton

WHEN the connecting pipes have been silver-soldered in place, and the unit dismantled, check up to see that nothing has moved, and that no pipe bends stick out beyond the line of the two cylinder walls in front ; if this has happened, it may be possible to squeeze the offending pipe back into line ; it will be in a well-annealed condition for the operation, but it would be better, of course, to observe this point before making up for good. Also, test the various pipe runs. To do this, hold the unit under water, port-face upwards, and with a piece of thin rubber tubing in the mouth, hold the other end of the rubber over each port-hole separately and then blow bubbles ; this is a little game now known as "Guess where the next one is coming from."

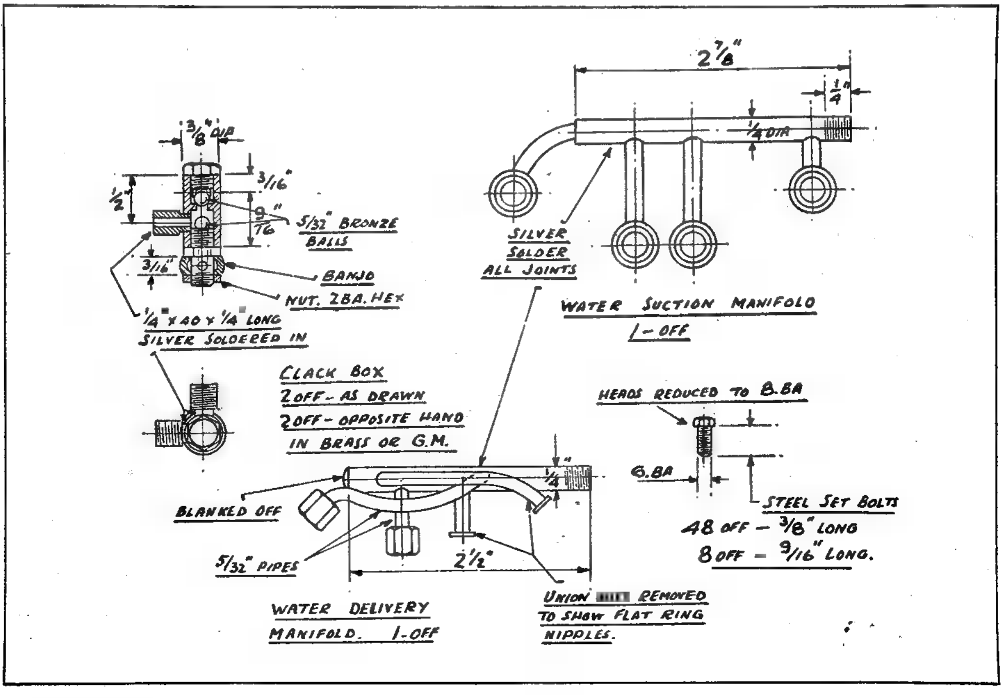
When this part of the work has been completed, prepare the port-face by rubbing it down with fine emery-cloth laid on a dead flat surface ; better still, on a dead flat oilstone, even if it does take much longer. I am much in favour of having the abrasive "captive," and not liable to come away and get embedded in the work—a very distinct possibility when preparing non-ferrous materials. In the same way, I am not too keen on the lapping of bronze or gunmetal cylinder bores unless it is done by the captive stone strip, hone fashion. If you have bored your pump cylinders truly parallel and have given them a good finish, then leave them alone, but if they are not parallel then get them corrected—whatever method you may employ.

I would now suggest that you make up the four water-clack fittings, making careful note of the left- and right-hand branch arrangements, and that, on completion you test each one separately.

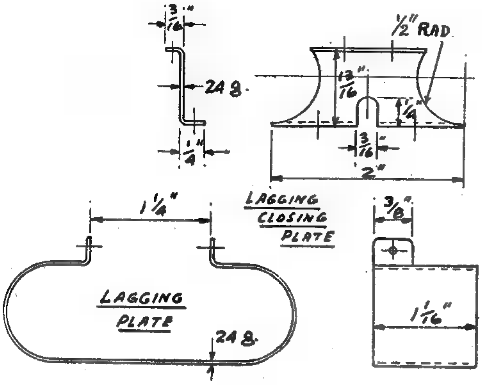
When this has been done, they may be screwed into their respective places, set dead square and upright, and then, with a small blowlamp flame, sweated round the thread portion with soft solder. Again check up to see that no passages are blocked.

Now take the two trunk parts, and mark out the large and small openings to be made in them, and still with due regard to any marking that may have been made for assembly reference. The men with ¼-in. and ½-in. end-mills and verti-

*Continued from page 577 "M.E." October 12, 1950.



cal slides will need no guidance on how to do this job ; but those who have no such equipment may like a word of advice. You can start by making a series of drilled holes, later opening up with an "Abrafile" or similar type of tension file, for the $\frac{1}{4}$-in. slot, and by drilling to say, 15/32 in. diameter on the wide side and at the middle of the slot, later spreading it or elongating it to form



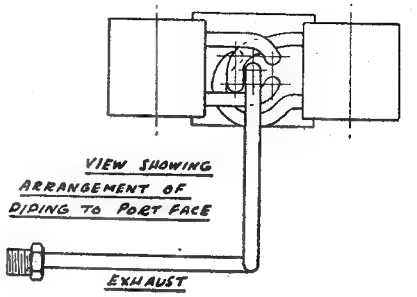
the finished slot. Whatever you do, hold the part in a machine vice and *not* in the fingers, and for this particular job, grind the positive rake away from the cutting edge of the drill to prevent it grabbing and tearing up the work. Almost as easily, you could file *across* the face of the trunk body until you break through into the bored centre, then cleaning up with a round file through the aperture so made. At least the accuracy of the slot is not all that important, and it serves only as a clearing space for the links to work on the piston-rod trunnion.

The drawing calls for pistons in bronze (for gunmetal cylinders) or gunmetal (for phosphor-bronze cylinders). If possible make the pistons in stainless steel which forms the best combination with either cylinder material. Piston-rods *must* be stainless steel for very obvious reasons, and these should have true threads *exactly* 5/32 in. long, and positively no burr where the thread ends (very important is that). The pistons should also be truly tapped, and the first $\frac{1}{8}$ in. of the thread drilled out to [illegible] in. diameter.

The tiny trunnion should be made and pinned on in the dead midway position, and it should be turned up from the solid if possible ; that is to say, the projecting pins should be turned down on each side from the square parent section, and not take the form of separate pegs screwed in.

Make up the cylinder and pump cover gland nuts, threading a steam gland on the piston-rod and packing and tightening the gland *in situ*. Now slip the trunk member over from the other end and follow on with a water pump gland, also packed *in situ*. Screw a steam piston on the steam cover end, holding the free end of the rod in the lathe chuck for a grip ; do the same thing with the pump piston, holding the steam piston in the lathe chuck (with a bit of metal foil round it, of course) and the water piston in the drill chuck, with similar protecting foil round it. Cut out from 1/64 in. "Hallite" or other suitable jointing material, eight gaskets to go between the cylinder and pump covers, wind graphited packing round all pistons, and assemble the lot. Before you can bolt up to a finish, you will have to face the hexagon-head set-screw problem. This is quite a job in itself, due to the numbers required, but I am afraid there is no alternative.

Owing to an acute shortage of space and elbow room, you will have to make up all the 6-B.A.



set-bolts with 8-B.A. heads, if you want the job to be turned out with a good engineering look about it. Even if it were possible to condone the cheese-head screw, I doubt if you would find it very easy to tighten them up properly. Those who have simple filing rests for their lathes, will be able to convert a whole set of standard 6-B.A. bolts to the small heads, in a single evening, and think nothing of it ; but short of such a method, I am quite at a loss to know how to advise you.

Now make up the valve-rods and crossheads, the latter being shaped up by filing, if necessary and in the absence of any milling gear. The main thing is to get the slot to the right width. The slide-valves are just little blocks of metal with two slots across the back, at right-angles, and a cavity in the face. This cavity need only be a drilled hole provided that its length and position are equivalent to the square cavity shown, i.e. the diameter of the hole should equal the length of the cavity, 7/32 in.

Face off the slide-valve on the oil-stone, make the slide-valve nuts, and assemble the two valves in the chest, leaving off the cover plate for the time being. You will now be able to assess the accuracy of the two pairs of drilled and tapped holes for the steamchest glands and the top guides, and these must, at all costs, be made to take the sliding action of the valve-rods without binding.

You will notice also that there is practically no spare room between the two slide-valves themselves, and, if necessary, these and their nuts should be reduced until definite clearance is obtained. It may also happen that the sharp corners of the valve crosshead blocks tend to catch one another when passing, but a small amount of relief round the corners of the blocks, with a file, should dispose of the trouble.

Make up the two pairs of steel links that operate the gear, and once again, in view of the small amount of machining to be done, make these in stainless steel if possible. You will notice that

at [redacted] end the links [redacted] bushed, where they [redacted] on the piston-rod trunnions, and as the metal to be bushed is very thin, I suggest silver-soldering these in place. Each pair of links is fixed together by a pair of bolts, shown on the drawing [redacted] shouldered. The [redacted] not passing through the spacing sleeve must be shouldered [redacted] that, when it is tightened up, it does not pinch the sides of the valve crosshead ; the other [redacted] be [redacted] ordinary bolt. The shouldered bolt also forms the hinge-pin for the drop-link that hangs from the bronze swing-link hanger, screwed into the lower edge of the steamchest. This swing- or drop-link has [redacted] bushed hole for it to run on the shouldered bolt ; in this case, the metal is thick enough for the bush to be pressed in.

The assembly and timing of the valve gear is bound to take a little time, but will need to be done only once. The links [redacted] hooked over the piston rod trunnions, the bolts threaded through the swing-link and spacers, engaging the valve trunnion [redacted] the [redacted] time. Now move the piston-rod to both extremities of its stroke, to [redacted] if the valve uncovers the port aperture *equally* [redacted] both ends ; if it does not, take careful note of which way the valve nut has to be adjusted. You will have to release the links before this [redacted] be done, after which the square valve cross-head can be moved either a turn or a half turn in the required direction, and until a satisfactory setting is obtained.

At this stage, [redacted] test run on compressed air can be made to check up on joints, etc., and a thin jointing-washer should be made and fitted between the steamchest and the port-face plate, and one for under the cover-plate. Don't judge the pump by its performance on compressed air, as it is bound to work in [redacted] jerky fashion with no counter or back-pressure in the water pump section ; but the air test will suffice to prove out the valve setting, the pump should at least continue to work and to start itself, after being stopped in any position. A little oil should be put into the steam inlet whilst [redacted] test, as there will be no moisture from steam to lubricate it in the [redacted] intended, and it will help to settle the glands and other working parts.

If the pump persists in stopping at one particular place, look for some mechanical stiffness and, if this cannot be found, and without moving the position of the parts, remove the valve-chest cover. It may [redacted] happen that there is too much length in one of the slide-valves, and you should be able to spot this at once, the remedy being to file [redacted] little metal off the offending slide-valve. Don't forget that, in this gear, valve lap is practically negligible ; in fact, it isn't possible, nor would it be of any advantage from the efficiency viewpoint. Once the valve setting is correct, and the pump will perform conti-uously on compressed air, you [redacted] start on the pipework.

If you have [redacted] definite locomotive or steam plant to which this unit will be applied, you might find it more convenient to reverse the arrangement of the pipe manifolds, or to change one of them. The steamchest has [redacted] plugged entry, facing the normal supply union, and these are interchangeable. The water suction and delivery manifolds could just [redacted] easily be made to face the opposite way to that shown [redacted] the drawing, and the long fixed steam exhaust comprises enough pipe to allow it to be bent in almost any desired direction.

The water suction manifold, fitted with the " banjo " connections, is the easiest to make and the first to be fitted. I suggest you silver-solder some short pieces of pipe into the four banjo fittings, and then set them up on the pump. One of these should be bent round [redacted] shown, and [redacted] straight-edge be laid along from the outlet of this bend and across the other three straight pipes. Now make a mark on each pipe at this line, and allow for the length of pipe to enter the manifold.

When these pipes have been cut, make up the major pipe or manifold section, and scribe [redacted] mark this where the pipes will enter from the side. When the necessary holes have been drilled, all four pipes may be silver-soldered in place and, with everything soft from the blow-lamp, [redacted] little extra bending and twisting will allow the made-up fitting to be slipped over the clack-box unions without any trouble at all. If the banjos have been made carefully, and the faces are clean and true, no jointings of any kind will be necessary to complete the joints.

The lower steel baseplate will have to be removed to allow this water-pipe system to be assembled, and if it is not yet fitted with feet or fixing lugs, now is the chance to do so. The drawing shows two simple feet, silver-soldered on, but if some other type of fixing is preferred it can be used. The only thing to observe is clearance for the heads of the set-bolts that stick down below the bottom of the plate.

With the water suction-pipes fitted and the plate replaced, let us consider the water delivery system. This is the more awkward one of the two, if it is to be made to look neat and tidy. More than one way has been tried, including the system shown on the cover of THE MODEL ENGINEER of March 10th, 1949, and [redacted] which, incidentally, is [redacted] useful guide to the general layout of the finished article.

The drawing shows a manifold pipe, similar to that for the water suction system, but with four holes drilled in its wall to take the small pipes. I suggest a similar procedure for the marking out and lining up, but with [redacted] careful treatment of the two longer pipes that bend over and sweep past each other [redacted] their way home. The really tricky part of fixing this [redacted] the pump is the part requiring the use of a spanner, and it makes one wish that some brainy person would invent [redacted] tool that has just the spanner slot and nothing else round it. However, it *can* be done, which is all that matters.

Now [redacted] come to the two pieces comprising the lagging for the steam cylinders. The small closing piece hardly needs detailed description, except that it is fixed to the back of the port-face plate by [redacted] of two very small screws. The main lagging plate is made up and bent round to suit, and it might be [redacted] good plan to cut out a thin card pattern first, in order to get the length exactly right. This has two small flaps bent back to meet up with the sides of the steamchest ; but the holes must be blind to avoid breaking through into the steam space. Before fixing this main lagging sheet, make up [redacted] asbestos

string "pluckings [redacted] and stuff them all round and between the interstices of the "serpent's nest."

If you want to paint the job, and have [redacted] particular colour scheme in mind or to match existing plant, I consider [redacted] matt black finish the best of the lot, with just [redacted] small relief of signal-red inside the trunk members. All mine are painted in the following way :—Top and bottom plates, cylinder lagging, water pump bodies, outside of trunks, water clacks (except union parts), and manifolds, matt black. All motion parts, heads of studs edges of cylinder covers, both plain and glanded, steamchest cover, exhaust pipe and all union fittings, left bright or polished according to the nature of the part. The inside surface of the trunk member is signal-red, [redacted] stated.

Now what about operation hints? Very good, this is the main pipe layout. Steam from the boiler to the pump via a screw-down valve and 5/32 in. dia. pipe, the latter being [redacted] short [redacted] convenient, but not critical. The water feed pipe of the same diameter and supplying either by gravity or sucking up from [redacted] supply anything up to 2 ft. below the pump level. Water delivery in the [redacted] size of pipe, and running [redacted] a tee-fitting, [redacted] branch going direct to a main check clack [redacted] the boiler, and the other to a by-pass valve or stop cock with [redacted] visible outflow back to the water supply tank.

To operate the pump under steam, open the by-pass valve. Open the steam valve slowly, and wait for the pump to clear its condensate and settle down to continuous working. Don't let the pump race away. Watch the water outflow from the by-pass valve, and when all air bubbles have ceased and the water pulses out in [redacted] steady flow, shut the by-pass valve. This will slow up the pump, [redacted] the steam valve should be opened farther until the desired speed is achieved, depending [redacted] the boiler's needs. The pump has a very wide range of working speeds, from one stroke every 10 seconds up to hundreds per minute.

Once the pump has worked itself in, and is free mechanically, it should *start to pump water even before any pressure shows on the pressure-gauge.* I don't know how many times I have demonstrated it, but when I fire up my big locomotive, the pump always starts to do its job, *even before there is enough steam to work the blower.*

Well, that's the story of the pump, and I hope you have good fun building it, and good service using it. I prophesy both.

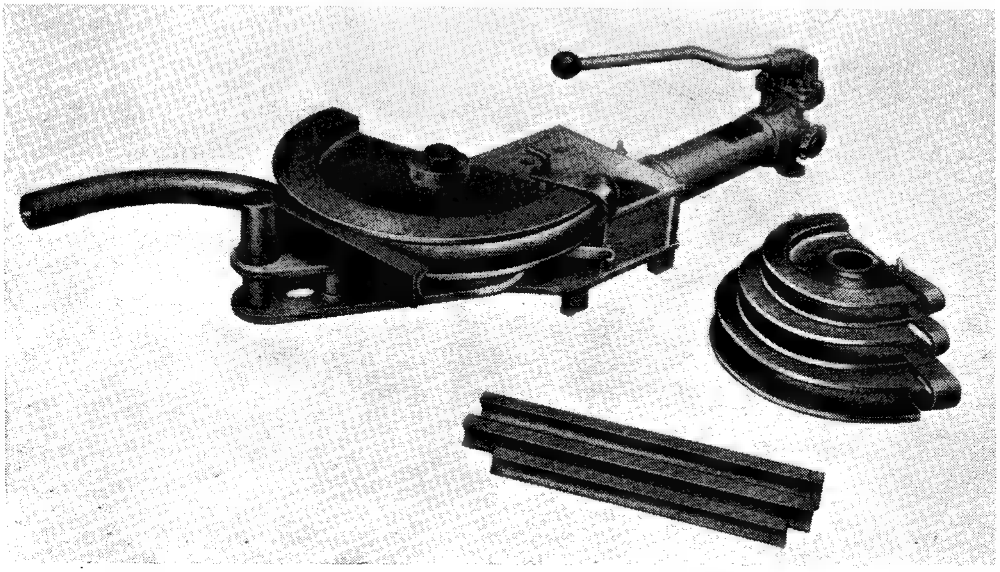
"Staffa" Copper Bending Attachments

MUCH experimenting in the bending of copper tube has proved that the most satisfactory, and thereby essential method of bending is that of [redacted] rotary motion around a shaped former in which the tube is located.

If attempts are made to bend copper tube in a shaped former between two fixed stops fitted within [redacted] former-head the tube will collapse.

To further the scope of the 2-stage "Staffa" bending machine, the above attachments have been developed to enable the bending machine to be speedily adapted. In operation the straight line push of the ram is converted into the required rotary motion.

Both attachments are of strong construction, all links and arms being of ample proportions, and being fitted throughout with high tensile-steel swivel-pins, which will render the attachments trouble free for many years hard wear and service with negligible maintenance. They are manufactured by Chamberlain Industries Ltd., Staffa Works, Staffa Road, Leyton, E.10.



IN THE WORKSHOP

by "Duplex"

No. 74.—*A Small Power-driven Hacksaw Machine

NEXT to be made and fitted is the [redacted] carriage, together with the [redacted] frame or bow in which the [redacted] blade is mounted.

The layout of these parts can be seen in previous photographs, which also show the subsidiary fittings connected with the saw frame.

The Carriage

The parts forming the [redacted] carriage [redacted] shown in the photographs Figs. 35A and 36 and also in the exploded drawing, Fig. 37 ; in addition, all the necessary dimensions [redacted] given in the working drawings, Fig. 38. It will be seen that the carriage runs on two ball-bearings which travel in the slot machined in the beam [redacted] but as this slot is necessarily of restricted length, [redacted] third ball-bearing is fitted in [redacted] bracket attached to the [redacted] frame itself and bearing [redacted] the underside of the b[redacted]

The latter bearing is adjusted so that the two outer ball-bearings [redacted] maintained in contact with the sliding surfaces, and thus prevent tipping of the carriage when the direction of the connecting-rod thrust is reversed [redacted] the crankshaft rotates.

Were the guidance of the carriage entrusted to the two bearings working in the beam slot, the position would be equivalent to that of a petrol engine having the gudgeon-pin located [redacted] point outside the lower end of the piston skirt, and in these circumstances rapid wear and piston slap would inevitably occur. In the present case, however, the provision of ball-bearings should eliminate wear and, moreover, the applied cutting pressure is unidirectional. The method of mounting the beam slot bearings is to make them a light press fit on the two cross-bolts fitted to the carriage, and metal or thin card shims are fitted so that, when the bolts [redacted] tightened, the parts [redacted] correctly adjusted to afford [redacted] close but free sliding fit for the carriage.

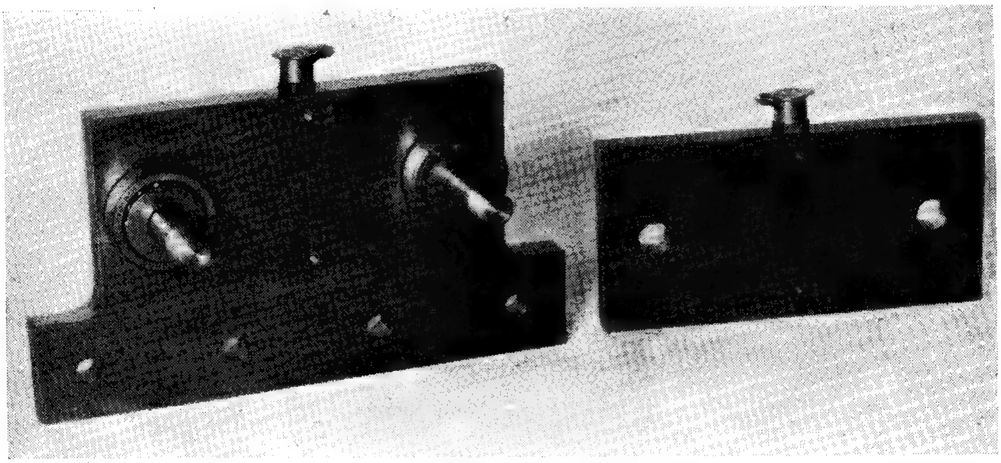


Fig. 35A. The parts of the carriage, showing the bearings in position and the lubrication system

It will be noticed that double-coil spring washers are fitted under the nuts ; this serves to maintain the carriage members in contact with the beam, but at the same time a relief of a few thousandths of an inch is afforded to allow for any irregularity of the sliding surfaces, present in the first instance or arising later [redacted] a result of localised wear.

The photograph, Fig. 35A, shows that oil-ways have been cut [redacted] the inner surfaces of the two carriage members ; these connect with drilled passages surmounted by a small cycle-type lubricator. In this way oil is fed to all the sliding surfaces of the beam, and it has been found in practice that a few drops of oil, given at starting, will maintain adequate lubrication of the parts for [redacted] considerable time ; moreover, the fact that the oil has but little tendency to become discoloured indicates that the oil film prevents metal to metal contact and [redacted] largely eliminates wear. The oil channels illustrated were actually cut in the shaping machine, but they can quite easily be formed by hand with [redacted] small V-pointed cold chisel or cut with [redacted] V-tool by [redacted] shaping operation in the lathe.

The bow is cut out from [redacted] strip of mild-steel, $\frac{1}{4}$ in. in thickness. When attaching the frame [redacted]

*Continued from page 530, "M.E.," October 5, 1950.

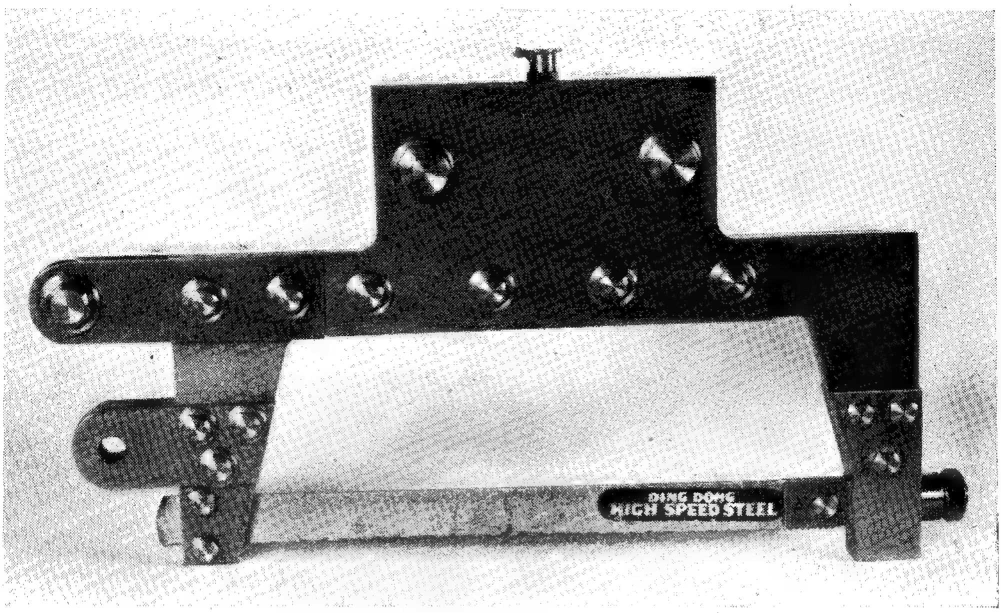


Fig. 36. The carriage with the saw frame and its attachments

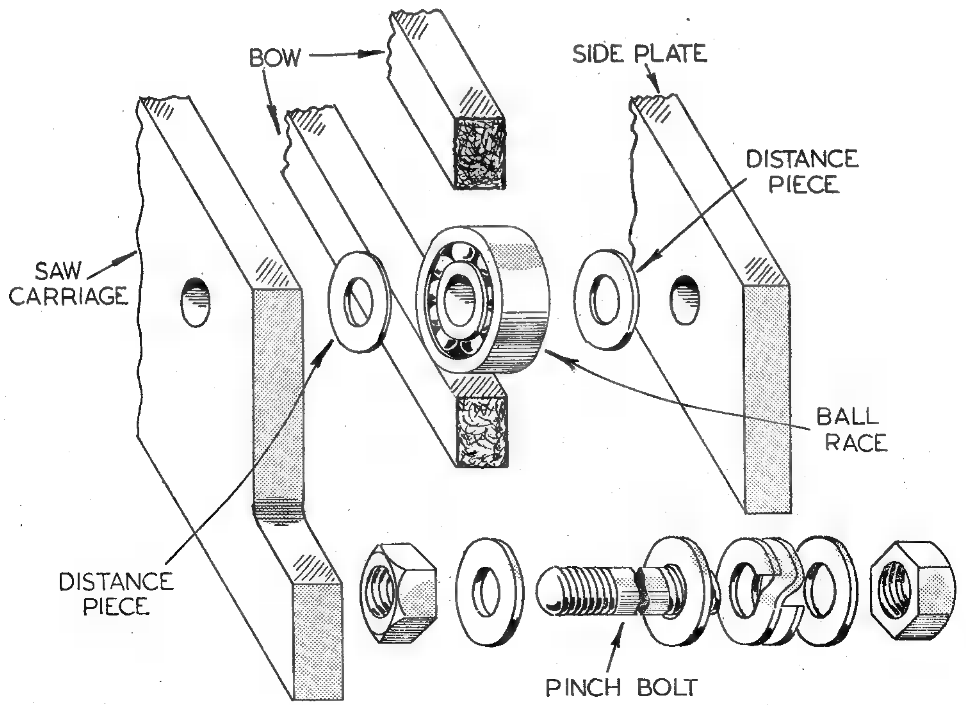


Fig. 37. Showing the construction of the carriage and its bearings

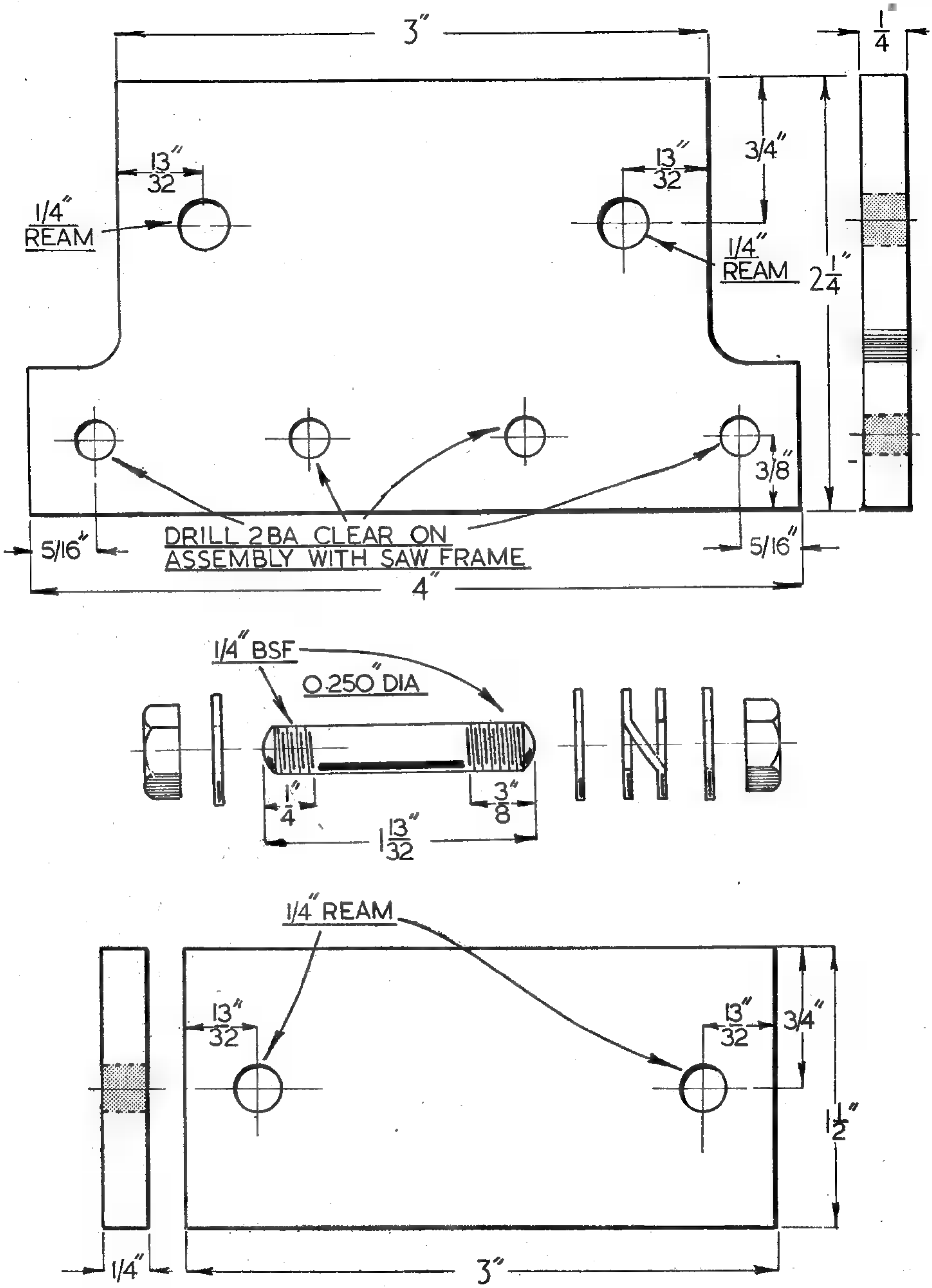


Fig. 38. The carriage side-members and the bearing pivot-bolts

the carriage, a slip of paper is inserted between the upper surface of the frame and the lower edge of the beam, so that the parts are slightly separated when clamped together with tool-makers' clamps for drilling the holes for the attachment screws. This clearance is given to ensure that the sliding pressure is taken on the ball-bearings themselves and not on the narrow, plain surfaces which are quite unsuited for this purpose.

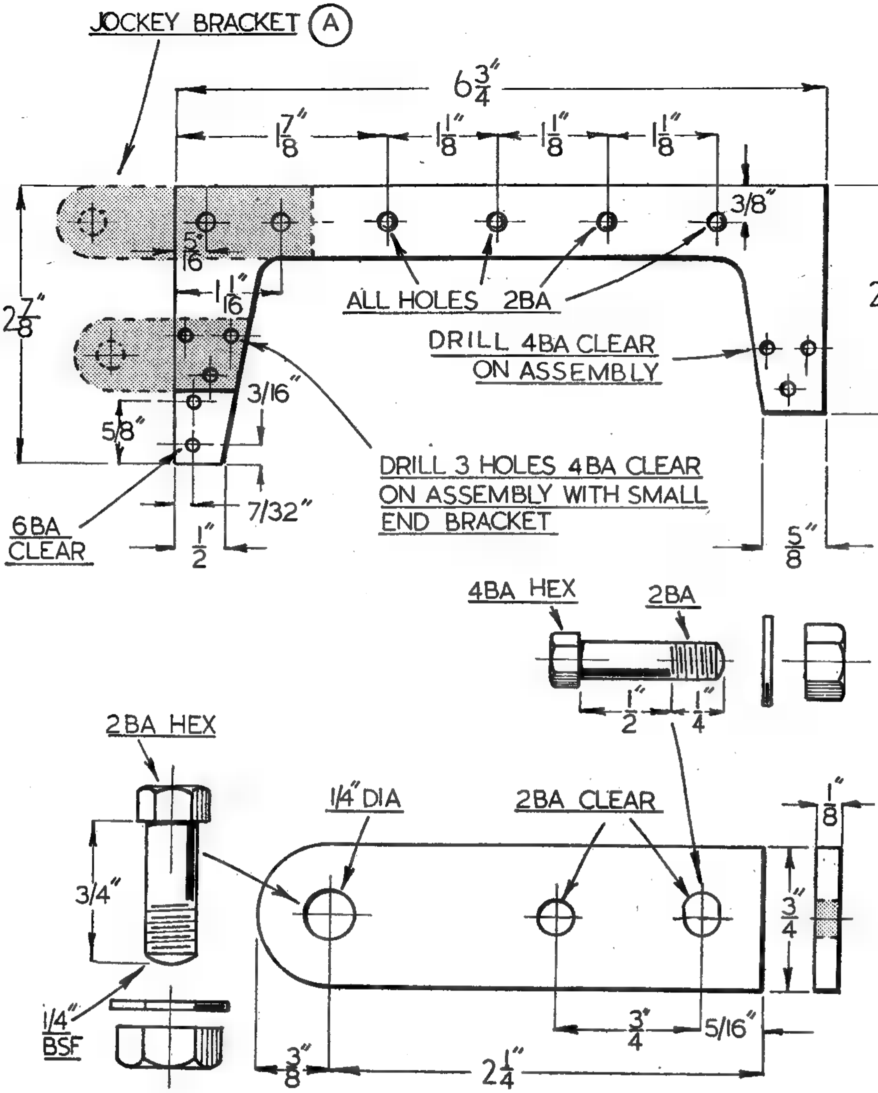


Fig. 39. The saw frame and its jockey bearing-bracket

The Jockey Bearing

The position of the jockey bearing and its bracket attached to the [redacted] frame is shown in Fig. 36, and the details of the construction [redacted] given in Fig. 39. It will be [redacted] that [redacted] bolt hole formed in the bracket members is slotted; this allows the position of the bearing to be adjusted to take up any play in the slides. A shim is fitted on either side of the inner race of the ball-bearing so that, when the pivot bolt is tightened, this [redacted] is securely clamped and at the [redacted] time the outer race is left free to revolve. The bracket side-members also serve to enclose the bearing and prevent the entry of swarf.

The [redacted] frame is drilled for the attachment of both the jockey bearing-bracket and the small-end bracket by clamping [redacted] side member of these brackets to the frame, and then using it as [redacted] drilling jig to ensure accurate spacing of the bolt holes. When the carriage has been assembled [redacted] the beam and the [redacted] frame attached to the carriage, the jockey bearing-bracket is swung upwards so that the outer [redacted] of its ball-bearing is brought into contact with the under side of the beam; this will restrain the carriage from tipping in either [redacted] upward or downward direction. With this arrangement, the point at which the cutting pressure is applied to the saw blade will always lie between the two outer ball-bearings.

(*To be continued*)

The Paris International Regatta, 1950

WHEN the French champion, M. Gems Suzor, and the Swiss brothers Pierre and Jean Louis Chevrot, visited the International Regatta held [redacted] Derby on August 12th and 13th, they appealed to the British model power boat enthusiasts to try to send [redacted] representative team to Paris to compete in the French regatta to be held [redacted] the Croissy lake [redacted] Le Vesinet, about fifteen miles from the French capital.

As [redacted] result, it [redacted] arranged for three members of British clubs to go representing the British Model Power Boat Association; they were, George Stone of the Kingsmere club, who took two boats, *Lady Babs* and *Lady Cynthia*, two of the fastest 10 c.c. boats, George Lines of the Orpington club, with *Sparky*, the fastest 15 c.c. boat and Kenneth Williams with *Faro*, the fastest in the 30 c.c. class, who [redacted] from the Bournville club [redacted] Birmingham.

M. Suzor had very kindly arranged for hotel accommodation, and each of the competitors was delighted to receive [redacted] official acknowledgement of entry from M. Raymond Quentin, the secretary of the Modele Yacht Club de Paris.

The morning promised [redacted] good day for the regatta, and this [redacted] fulfilled later. Racing started about 11.0 a.m., with the 10 c.c. class, and many good runs were made, then after [redacted] break for [redacted] excellent lunch, taken at a restaurant in the township of Le Vesinet the full programme was run off. Many of the 10 c.c. boats showed a remarkable turn of speed, but proved unable to complete the 500 metres course either by capsizing or stopping for [redacted] other reason; [redacted] the finish of two [redacted] for each boat the highest speed recorded [redacted] by M. Robert Jonet with *Eole* [redacted] [redacted] 94.737 k.p.h., equal to 59.21 m.p.h. George Stone still seemed to be followed by his jinx and had some difficulty in getting his boats away. It may be that the humid atmosphere of the morning had somewhat upset carburation [redacted] the engines, and he [redacted] unable to complete a run.

As there were no 15 c.c. boats entered by the French competitors, it [redacted] agreed that George Lines should compete in the 10 c.c. class. *Sparky*, however, struck a patch of trouble, and for some unaccountable [redacted] the long bridle (4 ft. 6 in.) which had been fitted to comply with the length of line used on the Continent, failed to keep the boat [redacted] its true course and it broadsided rather badly throwing up a lot of spray. Naturally this prevented *Sparky* showing her real speed although the engine was evidently in very good tune.

The line [redacted] changed for the 30 c.c. class boats, in which there was only one French boat able to compete, M. Suzor's *Nickie* 8, which made an appearance [redacted] the M.P.B.A. Grand Regatta of 1949 [redacted] Victoria Park. This has [redacted] very nicely made hull and 4-stroke engine, and made [redacted] very good run [redacted] 78.947 k.p.h., equal to 49.34 m.p.h.

Faro [redacted] next, and delighted everyone with [redacted] good runs, the first of which exactly equalled M. Robert Jonet's *Eole* 10 [redacted] 59.21 m.p.h. As it [redacted] still early it [redacted] then decided that everyone should have another run, [redacted] *Faro* made [redacted] third attempt [redacted] a speed between that of the two previous runs. After changing the line again, the 10 c.c. boats all made another attempt, and this time many of them had better luck, finishing the course [redacted] considerably higher speeds. George Stone's *Lady Babs* made [redacted] really startling display; after getting away to [redacted] good start her speed built up to well over 70 m.p.h.; she became completely airborne, then landed still at speed and carried on for another lap when exactly the [redacted] thing occurred again; on the next lap she left the water once more, and it [redacted] asking too much of Providence to get away with it again; she dived in the water only [redacted] few yards short of the finishing line.

A very welcome visitor to the regatta [redacted] Sir Robert Bland Bird who brought his grandson, and gave [redacted] very entertaining [redacted] with two straight running prototype boats which showed [redacted] very good turn of speed and seaworthiness.

The final regatta results were :—

10 c.c.

Swiss—1 J. L. Chevrot, *Folbrise VI*: 105.882 k.p.h. = 66.17 m.p.h.

Swiss—2 P. Chevrot, *Bepop II*: 97.826 k.p.h. = 61.14 m.p.h.

French—3 Robert Jonet, *Eole* 10: 94.737 k.p.h. = 59.21 m.p.h.

French—M. Devauze, *Vano*: 84.112 k.p.h. = 52.57 m.p.h.

30 c.c.

British—1 K. Williams, *Faro*: 94.737 k.p.h. = 59.21 m.p.h.

French—2 G. Suzor, *Nickie* 8: 78.947 k.p.h. = 49.34 m.p.h.

The racing finished, the whole party repaired once [redacted] to the restaurant at Le Vesinet, where [redacted] magnificent repast in the traditional French style had been prepared. The dinner [redacted] like a big family party, and the friendly atmosphere was very much enjoyed by the British visitors. After [redacted] amusing speech, the trophies were presented by M. Suzor, and suitable replies were made for the visitors by Sir Robert Bird, George Stone, whose remarks in English [redacted] translated by Pierre Chevrot, and Kenneth Williams.

The British team brought back from France very happy memories of the kind and [redacted] welcome accorded to them by everyone, and would like to thank particularly M. Gems Suzor the president and Madame Suzor, M. Raymond Quentin, the hardworking secretary of the Modele Yacht Club de Paris and Madame Quentin for their kindness.

These pleasant sports contests, which [redacted] quite free from any commercial influence, do very much to cement friendships between the people of neighbouring countries, and [redacted] valuable in the present times of stress.

Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by stamped, addressed envelope, and addressed: "Queries Dept." THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered within the scope of this service.

No. 9864.—Marking-out Dye
T.B.S. (Gateshead)

Q.—Can you please supply the name of the spirit varnish now on the market which is used for painting on work prior to marking-out, also the address of supplier?

R.—Any good quality shellac varnish or french polish can be used in the way you suggest, but there is available a quick-drying preparation containing blue aniline dye which is much more convenient to use than a varnish. This can be obtained from most large tool dealers, but if you have any difficulty in obtaining it, we suggest that you apply to Messrs. Buck & Ryan Ltd., 310, Euston Road, N.W.1, specifying that what you require is quick-drying marking colour, and not the non-drying preparation known as mechanics' blue.

No. 9869.—Converted Surplus Motor
R.L.H. (Slough)

Q.—I have recently bought an electric motor which was sold to me as a mains motor (230 volts, a.c.). It has obviously been converted, as I find that when I run it on mains the speed is roughly 14,000 r.p.m., which is naturally much too high. There is very little power output, and it runs very warm. From this I think you will agree that it is not a very practical proposition as a mains motor. Could you please give me an idea as to how it was connected up originally? A description is as follows: there are four field coils and brushes, two opposite brushes being in series with the field windings and the other lead-in is to the remaining two brushes.

R.—If the motor was designed for direct current working, it is unlikely that it would be suitable for use on an a.c. supply. For a motor to operate on an a.c. current, it is necessary that the whole of the field system be laminated. It appears that the motor has been connected as a simple series motor; in any case, its performance under these conditions would be unsatisfactory. Certainly, the motor can be made to run, as you have found out. As a series motor the speed will be high; the speed you quote would be quite normal for a series motor in a particular case. It is not possible to say in what manner the motor was connected originally; it could be connected as it is now or it could have been connected as a shunt motor. As the nameplate says 0.5 h.p., it is possible that it could have been connected for series operation but having the field coils connected all in parallel. We must point out that most surplus motors were designed for a specific purpose and that very few of them are suitable for conversion for operation on a normal supply.

No. 9859.—Compressed Air
R.E.M. (Southampton)

Q.—I have fitted up a small air compressing plant as follows: container 15 in. × 12 in. circular type, compressor SH6/2, pressure gauge. Will you please tell me the following:—

(1) What pressure in p.s.i. will be shown on the gauge when tank is full of compressed air?

(2) What will the tank hold in p.s.i. and is it possible to fit an automatic blow-off valve when tank is full?

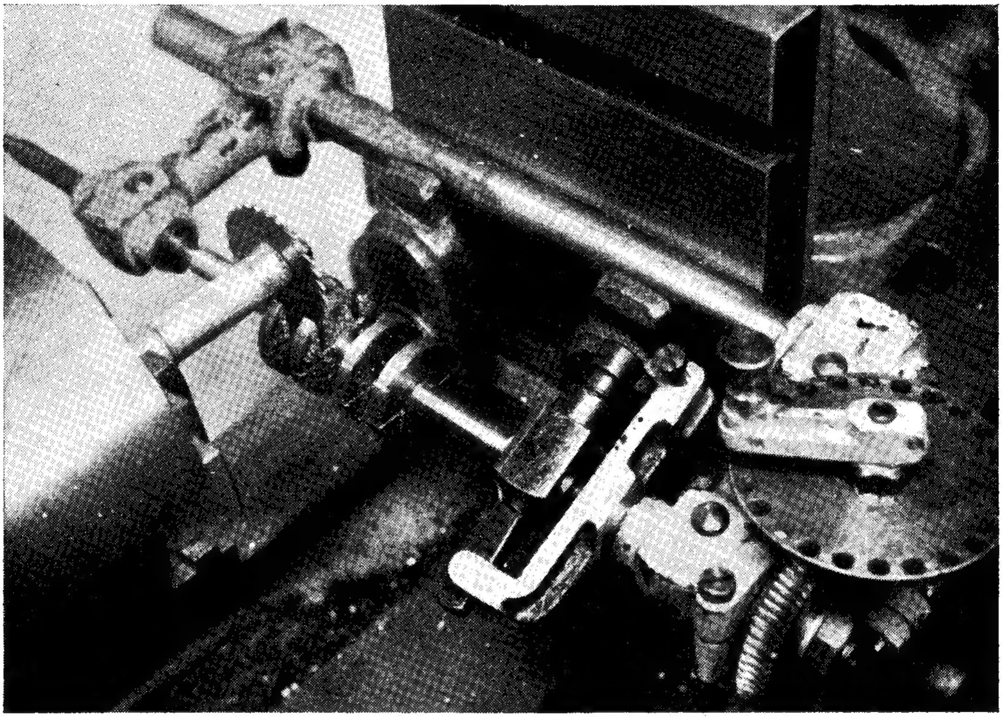
R.—(1) The expression "full of compressed air" has no definite meaning, because the fact that air is compressible means to say that the quantity which can be contained in a tank depends entirely on the pressure, and provided that the compressor is capable of working to a sufficiently high pressure, more and more air can be compressed into the tank as the pressure rises.

(2) The amount of pressure which can be contained in a tank depends entirely on the strength of its structure, and before putting any pressure tank into service, it should be tested with hydraulic pressure to at least 50 per cent. more than the maximum pressure it is intended to hold in normal service. An hydraulic test can quite easily be applied by filling the tank with water and using a small hand-pump to pump further water in it to raise the pressure (a pressure gauge should, of course, be connected to the tank at the time). It is quite practicable to fit an automatic blow-off valve, which should, in any case, be fitted as a safety measure, but in air compressing plant, it is usual to interconnect the automatic valve to an unloading device on the compressor, or to a motor switch, so that the compressor is not required to carry out unnecessary work.

No. 9840.—Machining the "Ladybird"
A.L.P. (Chalfont St. Giles)

Q.—I have been reading with interest the articles on the "Ladybird" c.i. engine, and would be very grateful if you will give a rough sketch to show the setting-up for sawing the crank-disc webs to shape in the lathe.

R.—The photograph reproduced herewith shows the actual set-up for sawing away the crank webs of the "Ladybird" engine. The particular fixture that was used in this case was the little dividing attachment which has been fully described in THE MODEL ENGINEER, but a much simpler arrangement would have sufficed in this particular case, and we suggest that it would be possible to fit up a pair of plain centres held either on the cross-slide or in the toolpost, with a suitable gear wheel temporarily attached to the shaft to use as an indexing device. Two cuts are taken at right-angles to the plane of the crankpins and on the centre-line of the shaft. These are run straight through all four webs on each side. For the cuts parallel with the plane of the crankpin, the shaft is moved $\frac{3}{16}$ in. out of centre in each direction, and cuts taken through two webs only ; one such cut is shown in progress. If the saw used is of small diameter like the one shown, these cuts can be taken completely through the two webs without touching the other webs at all.



No. 9874.—Rotary Converter to Motor
A.E.A. (Evesham)

Q.—I should appreciate your help in the following : I have an *ex*-R.A.F. rotary converter type 30, input 9.3 volts 23 amps., output 7.2 volts 13 amps. and 225 volts 11 amps., which I have converted to an electric motor. The centre brushes and the field coil are connected in parallel, left-hand brushes removed and right-hand (input) brushes moved about 45 deg. in a direction opposite to motor rotation, while terminals are joined together. The motor develops quite good power, sufficient to run a 4-in. grinding wheel but gets very hot in the winding near input armature. Can you advise how to reduce this, or suggest any alternative form of winding ?

R.—At the outset, we would say that these machines were designed for a definite purpose, and not meant for operation on a normal supply. Any attempt to run the converter must be of an experimental nature. Your connections would be wrong in any case. A motor intended to be run on an a.c. supply cannot be shunt connected ; with such a connection it cannot run. The fact that yours runs is due to the fact that you have the low tension winding shorted and the motor is running more or less as a repulsion motor, the high tension winding taking practically no part in the operation. Your experiment should be on the following lines : connect the H.T. comm.

and the field coils in series with the supply, when the machine will run under these conditions at some speed and power. If the speed is satisfactory and the power is low, reconnect the field coils in parallel and then in series with the H.T. comm. This will give you increased power, the idea being to weaken the field magnetism. The two remaining comms. are not connected in any way at all. Alternatively, you could short the L.T. comm. as now, and put the full supply on the field coils by themselves, either in series or parallel.

No. 9865.—Lathe Motors
J.R. (Wakefield)

Q.—I have a 3-in. metal-turning lathe, and I want to drive it direct from an electric motor (without any countershaft or anything) from the mains. I would like you to answer these questions :—

(1) What h.p. of motor shall I require ?
(2) What kind of switch should be used ?
(3) What capacity of fuse or fuses are needed ?

R.—It is not generally practicable to drive a metal-turning lathe directly from an electric motor without using a countershaft simply because the motor speed is far too high and cannot conveniently be reduced in a direct drive to the cone pulley of the lathe. This arrangement is practicable on wood-turning lathes which use much higher speeds, but the usual type of electric motor used in small installations runs at a speed of 1,425 r.p.m., whereas the highest speed of the metal-turning lathe when driving on the smallest step of the cone pulley should not be much above 800 to 1,000 r.p.m., and still lower maximum speeds are often advisable.

In reply to your specific questions :

(1) A motor of $\frac{1}{4}$ h.p. will supply adequate power for a 3-in. metal-turning lathe.

(2) Most modern motors are designed so that they can be switched directly on to the mains, using a single pole switch, but the ordinary type of lighting switch has not sufficiently heavy contacts to give really good service in driving a motor. A switch specially designed for use on a power circuit is desirable, and in many cases, manufacturers supply special forms of switches for use on motors.

(3) We suggest that the fuses in the motor circuit should have a capacity of not less than 15 amps., and a fuse in each of the supply leads is desirable.

PRACTICAL LETTERS

Pen Friends Wanted

DEAR SIR,—I have found your magazine very interesting, especially the articles about hydroplanes and power plants. I have built a hydroplane and it runs rather well ; the engine is a 7.5 c.c. rocket motor.

Now I wonder if you can help me to get letter-friends among readers of THE MODEL ENGINEER.

I am 20 years of age, and last spring I took what we here in Sweden call "studenten." I am fond of drawing, too. Other interests : cars, airplanes (have built some sailplanes) and so on.

Now I do my military service and have very few opportunities for model building.

I want to learn English better and that is another reason why I want a letter-friend.

Please forget my grammatical faults ; with some practice they will disappear, perhaps.

Yours faithfully,
BENGT-ENK MODIN.

My address :—
1857-20-49 Modin,
K.A. stud. komp. K.A.1.,
Oscar-Fredriksborg,
Sweden.

Induction Motor Design

DEAR SIR,—I note in THE MODEL ENGINEER issue dated July 6th, a query (No. 9813) regarding an induction motor. This appears to be exactly like a Delco motor, model A2271, which I am using and the following additional information may assist "E.A.W."

The steel stamping which has a raised bevelled part is in fact a switch with two contacts at its upper end. The shaft goes through this with a very large clearing hole. The light spring, cap, and sliding disc, go crosswise through the shaft. When the shaft is stationary the spring presses the disc towards the shaft and this in turn pushes the bevelled steel plate in and thus "makes" the contact. As the rotor speeds up, the disc flies outwards clear of the bevel, and under the action of another spring the bevelled plate moves out and "breaks" the starting circuit.

This is a particularly simple and trouble-free piece of apparatus and the only troubles likely to appear are burnt contacts, which can be replaced, or a flat worn on the small fibre disc so that it fails to close the contacts.

The rotor is a normal "squirrel cage" with solid bar conductors all sweated into rings at the ends of the armature laminations.

If "E.A.W." requires any further information I will willingly strip my motor down and send him diagrams.

The "M.E." Projector

Now just a short note on another subject. I have been working on an 8 mm. version of the "M.E." projector. It has passed trials most successfully in a hand-driven test. The two-pole induction motor is now made and only requires winding. This job will have to be put aside till the end of October as I want to film the winding operation and my spare time is exceedingly limited at present.

Yours faithfully,
A. J. CANNON.

Stanger, Natal,
South Africa.

Screwcutting on Plain Lathes

DEAR SIR,—In THE MODEL ENGINEER dated September 14th, Mr. Booth, of London, has given details of a most interesting device for obtaining threads on a plain lathe. It is obvious that the basis of the method is taken from the "monkey" screwing device which was fitted at one time to many brass-finishing lathes, and which, I believe, was a forerunner of the leadscrew, and gearbox. This screwing device was used extensively about 30 years ago, and indeed is still used, to a limited extent, in many engineering establishments, but is slowly and surely dying out.

Nevertheless, the device as outlined by Mr. Booth has much to commend it, and shows an ingenuity to be applauded. The "monkey" screwing tackle as used on a full-sized lathe consists of a range of cast-iron cylinders (or barrels, as they are often called) which are screwed externally, the threads often being of the buttress type, but not always so. A range of brass "followers" is also supplied, the threads of which are cut to suit the barrels.

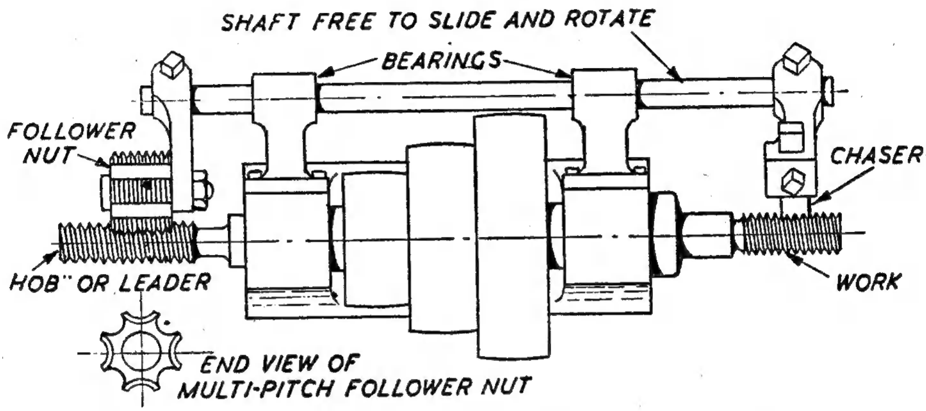
In operation, a barrel is put on the stationary spindle, a dowel pin on the gear wheel of the lathe engaging in a hole on the end of the barrel, thus acting as a driver. A horse-shoe washer is slipped over end of barrel to keep it in position. A brass follower is then selected to suit the barrel and fitted into a movable arm, which is in turn connected to a toolpost and saddle, which lies angularly to the lathe bed, and works on a swivel, being brought right down on the lathe shears when screwcutting is being done. The number of threads on the barrel and follower determines the amount of threads per inch to be cut on the work, and the whole device is as simple as ABC.

I know of at least one well-known firm who still incorporate the "monkey" attachment on certain of their lathes, although it is only fair to say that it is given as an extra, an excellent leading screw being standard equipment for threading.

Yours faithfully,

Glasgow, S.4. R. JOHNSTON.

[The method referred to by our correspondent is quite a well known one, and lathes specially equipped for chasing threads in this way have been produced by several manufacturers in the past. Up to a few years ago, a well-known London firm used such lathes regularly in the mass production of gas fittings; the equipment for chasing was known in this factory as "hob and drag." Reference to the method is made in the "M.E." handbook *Capstan and Turret Lathes*, from which the diagram below, showing the principles involved is reproduced.—TECHNICAL EDITOR—"M.E."]



Light and Colour

DEAR SIR,—I should like to express my appreciation of the above article by Mr. G. W. Allinson.

After many years of "war finish" I was unable to really tolerate my new lathe in its coat of sober grey, so I painted it light green and the back-gear guards a cheerful orange. The workshop looked so much more inviting that I treated the hand-shaper and the bench drill similarly. The vice was also repainted a rich blue with the manufacturer's name "picked out" in red.

Soon after this outburst of colour, a friend paid a visit and was so impressed that he went away and did likewise—only he chose blue for his lathe and bright yellow for the treadle flywheel.

Anyone who has a dark and dingy workshop should investigate the possibilities of brightening it up with a little colour, adopting, perhaps, the colours of their favourite railway or showman's engine.

Yours faithfully,

Oxford. K. W. G. TAYLOR.

Refrigeration Gases

DEAR SIR,—With regard to the letter by Mr. Brother, of Stroud, on the above subject, I was given the name of Hedley & Co. (Leytonstone) Ltd., 120, Harrow Road, Leytonstone, and was able to obtain 3 lb. of methyl chloride there. My cylinder I obtained from Dean & Wood (London) Ltd., 145, Upper Thames Street, E.C.4. It is of 4 lb. capacity and cost, with valve, £2 1s. 0d I hope this will be of some assistance.

Yours faithfully,

Enfield. WM. C. FRASER.